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Final Environmental Impact Statement

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Water Reservation Applications For The Missouri River and Its Tributaries Below Fort Peck Dam

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ABBREVIATIONS

af — acre-feet
af/yr — acre-feet per year
APA — Administrative Procedure Act
ARM — Administrative Rules of Montana
BHES — Montana Board of Health and Environmental Sciences
BLM — United States Bureau of Land Management
Board — Montana Board of Natural Resources and Conservation
BUREC — United States Bureau of Reclamation
cfs — cubic feet per second
Corps — United States Army Corps of Engineers
CRP — Conservation Reserve Program
DFWP — Montana Department of Fish, Wildlife and Parks
DHES — Montana Department of Health and Environmental Sciences
DNRC — Montana Department of Natural Resources and Conservation
DO — dissolved oxygen
EIS — environmental impact statement
EPA — United States Environmental Protection Agency
FAO — United Nations Food and Agriculture Organization
gpd/ft — gallon per day per foot
gpm — gallon per minute
GWh — gigawatt hour
HB — House bill
JTU — Jackson turbidity unit
kWh — kilowatt-hour
MBMG — Montana Bureau of Mines and Geology
MCA — Montana Code Annotated
MEPA — Montana Environmental Policy Act
mg/l — milligrams per liter
MNHP — Montana Natural Heritage Program
MPC — Montana Power Company
MW — megawatt
MWh — megawatt-hour
N — nitrogen
NDSWC — North Dakota State Water Commission
NO_3-N — nitrate-nitrogen
NTU — nephelometric turbidity unit
P — phosphorous
RGE — range
SAR — sodium absorption ratio
SCS — United States Soil Conservation Service
SEC — section
SHPO — Montana Historical Society, State Historic Preservation Office
TDS — total dissolved solids
TSS — total suspended solids
TWN — township
ug/l — micrograms per liter
USDA — United States Department of Agriculture
USFS — United States Forest Service
USFWS — United States Fish and Wildlife Service
USGS — United States Geological Survey
UT — unnamed tributary
WETP — wetted perimeter inflection point
yr — year

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

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August 11, 1994

TO ALL INTERESTED PERSONS:

This environmental impact statement (EIS) has been prepared by the Montana Department of Natural Resources and Conservation (DNRC) on behalf of the Board of Natural Resources and Conservation (Board). The EIS analyzes the impacts on the environment from the proposed reservations of water in the Missouri River Basin below Fort Peck Dam.

Reservations of water have been sought by the following state agencies and state subdivisions:

Conservation Districts:

Blaine County
Carter County
Daniels County
Liberty County
Little Beaver
McCone County
Richland County
Roosevelt County
Sheridan County
Valley County
Wibaux County

Municipalities:

Chinook
Circle
Culbertson
Ekalaka
Fort Peck
Harlem
Havre
Hill County Water District
Malta
Plentywood
Poplar
Scobey
Wibaux
Wolf Point

State Agencies:

Montana Department of Fish, Wildlife and Parks

CENTRALIZED SERVICES DIVISION
406 444 6700

CONSERVATION & RESOURCE DEVELOPMENT DIVISION
406 444 6667

ENERGY DIVISION
406 444 6697

OIL AND GAS DIVISION
406 444 6675

WATER RESOURCES DIVISION
406 444 6601

On February 28, 1994 DNRC released a draft EIS. Informational meetings and public hearings on the draft EIS were held in Baker on March 21, 1994; in Glasgow and Havre on March 22, 1994; in Plentywood on March 23, 1994 and in Wolf Point on March 24, 1994. The 45-day comment period ended on April 14, 1994. DNRC received 474 written and oral comments on the draft EIS.

While not including any major changes from the draft EIS, the final EIS includes corrections, clarifications, and additions to the original text. Additional information also is provided regarding the United States Army Corps of Engineers' operation of the Missouri River system, a specific alternative presented in the draft EIS regarding the management of groundwater resources in Sheridan County, the possibility of using reserved water to raise specialty crops like sugar beets in the lower Missouri River basin, and recent changes in the status of several species under the Endangered Species Act. Public comments and DNRC's responses to the comments also are included.

The EIS does not recommend a course of action to the Board. The alternatives analyzed were used to describe the full range of impacts and options available to the Board and are not intended to limit negotiations and creative solutions that might be presented during the contested case hearing.

The Board has appointed a hearing examiner to conduct a contested case hearing in Glasgow during the weeks of September 19 and September 26, 1994. The public is invited to testify from 7 p.m. to 10 p.m. in Wolf Point on September 19, 1994, Plentywood on September 20, 1994, Baker on September 22, 1994, Glasgow on September 28, 1994, and Havre on September 29, 1994. Hearing times and locations where the public can give testimony will be published in newspapers of general circulation. Based on information in the applications, the EIS, and on testimony at the hearing, the Board will make a decision on the water reservation applications by December 31, 1994.

Further information, including additional copies of the final EIS, can be obtained by calling (406) 444-6759 or by writing to DNRC at 1520 E. Sixth Avenue, Helena, MT 59620-2301.

Sincerely,

Mark A. Simonich

Mark A. Simonich
Director

LOWER MISSOURI RIVER BASIN

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR WATER RESERVATION APPLICATIONS BELOW FORT PECK DAM

DNRC

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

AUGUST 1994

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GLOSSARY

Aquifer: A porous subsurface formation that contains groundwater.

Baseline: Pertaining to existing conditions.

Consumptive Water Use: Any use of water that results in water being consumed by plants, evaporated, or otherwise lost from its source and unavailable for other use.

Contested case hearing: A public hearing held if valid objections from existing water right holders are received to water reservation applications. The findings of the hearing will be submitted to the Board which will use them when reaching a decision on the water reservation applications.

Dead storage: In a reservoir, water which cannot be withdrawn because it is below the level of the outlet.

Discharge: The total volume of water in a stream passing a given point over a given period of time—quantified in this EIS as cubic feet per second, or "cfs."

Gigawatt: One billion watts, 1,000 megawatts.

Irrigation return flow: Water that returns to a surface water body after irrigation.

Mitigation: In the case of environmental impacts, an effort to avoid, minimize, or reduce such impacts.

Nanogram: One billionth of a gram (.000000001 grams).

Net present value: The value today of a sum of money that will be paid or earned in the future.

Percentile exceedance flows: Flow rates which have been equalled or exceeded at a given frequency over a given period of record.

Riparian: Relating to or living on the bank of a stream or other water body.

Water diversion: The removal of water from its source by use of a canal, ditch, pipe, or other conveyance.

Water rights, permits, reservations, etc.: See Chapter Two for definitions of all terms relating to water law.

SUMMARY

In February 1994, the Montana Department of Natural Resources and Conservation (DNRC) released its draft environmental impact statement (EIS) for Water Reservation Applications for the Missouri River and Its Tributaries below Fort Peck Dam. Public meetings were held to provide information and take comments on the draft EIS in five lower Missouri River basin communities from March 21 to March 24. The public had until April 14, 1994, to comment on the draft EIS. An additional meeting was held in Plentywood on June 2 to discuss further the Coordinated Groundwater Development Alternative for the Sheridan County Groundwater Area. This final EIS responds to comments and questions pertaining to the draft EIS.

MISSOURI RIVER WATER RESERVATION STATUTE

In 1985, the Montana Legislature directed the Montana Department of Natural Resources and Conservation (DNRC) to begin a water reservation proceeding for the Missouri River basin. In subsequent sessions, the legislature directed DNRC to add the Little Missouri River drainage to the proceeding. The legislature felt that implementation of a water reservation procedure would encourage more coordinated development of the water resources in the basin and would help form a strong and unified basis for protecting Montana's share of the Missouri River water from downstream states.

Under Montana water law, water can be reserved for existing or future consumptive uses of water and for maintaining instream flows to protect aquatic life, recreation, and water quality. Only public entities such as local governments, conservation districts, and state and federal agencies can apply for and hold water reservations. DNRC was assigned by statute to coordinate the process and to provide technical and financial assistance to conservation districts and municipalities in preparing their applications.

Due to the vast size of this basin, the Missouri River reservation proceeding has been split into two parts. Applications for water in the upper portion of the basin, which encompasses the drainage area upstream from Fort Peck Dam, were considered first. After an environmental review and contested case hearing, the Board of Natural Resources and Conservation (Board) made a final decision on the upper basin applications in June 1992. DNRC then began preparation of the draft and final environmental impact statement (EIS) for the lower basin reservation applications. The Board must reach a decision on water reservation applications in the Missouri River basin below Fort Peck Dam (including the Milk and Little Missouri River basins) by December 31, 1994.

APPLICATIONS

DNRC received 26 reservation applications for water in the lower basin. Fourteen municipalities applied for 46,167 acre-feet a year to meet future growth. Eleven conservation districts requested 276,407 acre-feet a year, primarily for 472 proposed irrigation projects covering 157,994 acres. The Montana Department of Fish, Wildlife and Parks (DFWP) applied to reserve instream flows on 21 streams or stream reaches to protect fish, wildlife, recreation, and water quality.

EIS PROCESS

The Montana Environmental Policy Act (MEPA) requires preparation of an environmental impact statement for major state government actions that have the potential to significantly affect the human and natural environment. An EIS examines the environmental, social, and economic impacts of the proposed action and is generally prepared in two phases—a "draft" and "final" EIS. Because the lower Missouri River basin water reservation proceeding is a major state action that could have substantial effects on the environment, an EIS was prepared.

In the fall of 1992, DNRC held five public meetings at different locations throughout the basin to identify important issues for analysis and inclusion in the draft EIS. DNRC also developed a computer model of the Missouri River basin to assess water availability. The draft EIS included discussion of issues raised by meeting participants, along with analysis based on the computer modeling. Further information, research, and analysis was provided by DNRC staff and consultants. The draft EIS was published and distributed in February 1994.

Distribution of the draft EIS was followed by a 45-day comment period during which DNRC accepted written comments on the draft EIS. Five public meetings were held to answer questions and take comment on the draft EIS (Table S-1). Based on public comment, DNRC held one additional meeting in Plentywood to discuss further the Coordinated Groundwater Development Alternative in the Sheridan County Groundwater Area. DNRC received 27 letters of comment and additional oral comment in response to the draft EIS. This final EIS was then prepared to respond to comments and questions pertaining to the draft EIS and to summarize and update information in it.

COMMENTS ON DRAFT EIS

Major issues raised in the comments pertained to the availability of water for the reservations; technical aspects of water law; appropriateness of a Board decision prior to completion of adjudication; how irrigation reservations would affect employment and taxes; the possibility of sugar beet production in the lower Missouri River basin; appropriateness of methods used to determine instream flow requests; impacts to wildlife; how the value of water for instream flow was determined including the applicability of using the value of water for recreation from the upper Missouri River reservation process; whether and how reservations in the Sheridan County Groundwater Area should be implemented; how these groundwater reservations would affect wetlands; and whether the Board should consider losses of hydropower production in downstream states. Many commenters indicated support or opposition to one reservation or another.

Table S-1. Public participation in meetings held to take comments on the draft EIS

Meeting location	Date	Number people attending
Baker	March 21, 1994	13
Glasgow	March 22, 1994	34
Havre	March 22, 1994	10
Plentywood	March 23, 1994	25
Wolf Point	March 24, 1994	25
Total		107

NEW INFORMATION

Since publication of the draft EIS, the U.S. Army Corps of Engineers has identified a preferred alternative in its review of the Missouri River Master Water Control Manual Review and Update (Review and Update). DNRC updated information regarding the Corps' review process, but the outcome likely will not be known before the Board makes its decision on the reservations.

Additional information is provided on the possibility of raising sugar beets with reserved water rather than alfalfa and small grains.

Many comments were received on the Coordinated Groundwater Development Alternative for the Sheridan County Groundwater area. In response to the comments, DNRC held a public meeting to provide additional information on the alternative. The outcome of that meeting is described in this final EIS.

Following publication of the draft EIS, the U.S. Fish and Wildlife Service changed the status of the bald eagle from endangered to threatened and received a petition to list the sicklefin and sturgeon chubs as endangered. All of these species are found along the lower Missouri River.

ALTERNATIVES

To address the full range of options available to the Board and potential impacts, DNRC selected several hypothetical alternatives to analyze in the EIS. They are: the Consumptive Use, Instream, Combination, and No Action alternatives. In Sheridan County, where extensive groundwater development is proposed, three additional alternatives were analyzed: the Grant All, Partial Granting, and Coordinated Groundwater Development alternatives.

Municipalities were included under all but the No Action Alternative and given first priority because of the relatively small amount of water requested for their purposes and the high value of water for municipal use.

The Consumptive Use Alternative emphasizes the use of water for irrigation and municipal purposes. First priority in this alternative goes to municipalities, followed by proposed irrigation projects, and then instream uses. All irrigation projects proposed in the reservation applications were included in this alternative.

The Instream Alternative gives first priority to municipal uses, but emphasizes instream reservations for the protection of fish, wildlife, recreation, and water quality. Some irrigation reservation requests were included in this alternative, but with third priority.

To some extent, the Combination Alternative is similar to the Consumptive Use Alternative in that it gives first preference to municipalities, second to proposed irrigation projects, and third to instream uses. It differs primarily in that proposed irrigation projects are only included if they are at least marginally economically and financially feasible at least 50 percent of the time.

In Sheridan County, the City of Plentywood would have first priority under all but the No Action Alternative. The Grant All Alternative would allow the Sheridan County Conservation District to use all the water it requested in compliance with the district's reservation management plan. The Westby-Dagmar aquifer has been studied and preliminary estimates of sustainable yield are available. Aquifers associated with Missouri River terrace gravels, tributary outwash deposits, and Big Muddy alluvium have not been studied extensively. Under the Partial Granting Alternative, the Board would grant the Sheridan County Conservation District a reservation for 7,809 af/yr, which includes both the amount the Westby-Dagmar aquifer can probably sustain without substantial adverse effects to existing water right holders and wetlands and the amount the associated aquifers might sustain.

The Coordinated Groundwater Development Alternative would allow a larger reservation of 17,470 af/yr--the maximum amount that DNRC believes the aquifers might sustain. To help ensure that existing water right holders and wetlands would not be adversely affected, the Board would limit full use of the reservation until the area is declared a controlled groundwater area or the basin is closed. If a controlled groundwater area is not designated or the basin closed, the Board could reduce the amount to that specified under the Partial Granting Alternative or deny the reservation request altogether. In either case, a committee would be appointed by the Board to oversee implementation of the reservation.

Under the No Action Alternative, DNRC describes trends that might unfold through the year 2035 if no reservations are granted.

BOARD'S AUTHORITY

The Board can grant, modify, or deny any or all of the reservation requests. Applicants must establish to the satisfaction of the Board the following four criteria:

a. the purpose of the reservation;
b. the need for the reservation;
c. the amount of water necessary for the reservation; and
d. that the reservation is in the public interest.

Besides these criteria, the Board also must ensure that the reservation applicants make progress toward development of the proposed use with reasonable diligence and that no reservations are granted that would adversely affect senior water rights. The Board will have to base its decision on the decision criteria described in Chapter Seven of the draft EIS and rely on information in the applications, draft and final EIS, and on testimony presented at the contested case hearing.

IMPACTS UNDER CONSUMPTIVE USE, COMBINATION, INSTREAM, GRANT ALL, PARTIAL GRANTING, AND COORDINATED GROUNDWATER DEVELOPMENT ALTERNATIVES

GENERAL CONSIDERATIONS

Environmental impacts are generally greatest under the Consumptive Use Alternative, less under the Combination Alternative, and least under the Instream Alternative. Because the Sheridan County Conservation District has not proposed to include consideration of adverse effects to wetlands in its management plan, the possibility of impacts was considered greatest under the Grant All Alternative and less under the Partial Granting and Coordinated Groundwater Development alternatives in the Sheridan County Groundwater Area. Some proposed projects included in all but the No Action Alternative would have substantial impacts. Not all potential impacts were assessed for some of the larger projects, where information was not required or available in the applications. A separate environmental review may be required before larger projects such as CBI-13 in Roosevelt County or the Battle Creek Reservoir (project BL-181) could be constructed.

WATER QUANTITY AND DISTRIBUTION

Impacts to streamflows would be greatest under the Consumptive Use Alternative, which would reduce flows slightly in the Milk and Missouri rivers, and moderately to substantially in the Poplar and Little Missouri River drainages. In several of these rivers and streams, late summer streamflows would be reduced to zero or near zero during dry years. Impacts to streamflows would be less under the Combination Alternative and least under the Instream Alternative.

GROUNDWATER

In the Sheridan County Groundwater Area, the amount of water applied for in the Grant All Alternative (113,587 af/yr) greatly exceeds any estimate of groundwater available for sustainable use. The impacts of this alternative would depend on how much water the Sheridan County Conservation District develops. The Westby-Dagmar aquifer might yield as much as 50,000 af/yr without affecting senior water rights for other wells. However, this would cause a drastic alteration in the hydrology of the aquifer. Aquifer water levels would decline and lakes and wetlands connected to the aquifer would decrease in size and possibly be eliminated. As aquifer levels decline, senior users would incur higher pumping costs, even though they could still fully exercise their rights.

Under the Partial Granting Alternative, major changes in the hydrology of the aquifer would be less likely because of the limited amount of water granted. However, this alternative does not effectively "tie up" all available groundwater in the area, which might limit the ability of the Sheridan County Conservation District to manage groundwater withdrawals.

Under the Coordinated Groundwater Development Alternative, the maximum estimated sustainable yield of the aquifers would be granted and a basin closure or controlled groundwater area may be established. The Sheridan County Conservation District would gain the right to the groundwater, while a local committee overseeing the reservation would have a hand in determining how and where the reserved water is used and when the sustainable level of development is achieved. DNRC would cease accepting applications for new water use permits only if a controlled groundwater area or basin closure were established.

LEGAL WATER AVAILABILITY

While water may be physically available for a reservation at the point of diversion, it may already be appropriated by a water user downstream. Water in route to downstream users is not legally available for consumptive use by junior users. Existing water users such as irrigators and Indian tribes already claim much of the flow in many of the Missouri River tributaries.

By law, water reservations cannot adversely affect the amount of water legally available to holders of water rights with a priority date earlier than July 1, 1985, in the Milk and Missouri River drainages and July 1, 1989, in the Little Missouri River drainage. However, a reservation may provide the holder with a stronger basis to object in DNRC proceedings on applications by existing water right holders to change their point of diversion, place of use, purpose of use, or place of storage. Obtaining a water reservation also may strengthen the reservant's standing to object to water rights claims submitted in the statewide adjudication proceeding, although the issue remains to be determined by the Water Court.

WATER QUALITY

Water reservations for consumptive use would cause a decline in water quality in some streams and groundwater systems. Higher concentrations of nutrients, pesticides, sediments, and salts would be noticeable in some waters, but in most instances the increases would be minor. Short-term increases in sediments would result from construction of reservoirs and diversion structures.

Arsenic originating in geothermal areas of Yellowstone Park persists in reduced concentrations in the lower Missouri River. Sufficient information is not available to determine whether new irrigation development with water containing arsenic would cause local and downstream surface water to increase in arsenic concentration and violate the state's ambient water quality standard.

In the Milk River subbasin, the cumulative effect of Battle Creek projects on water quality in the Milk River would be small. Streamflow of the Milk River near Harlem would be reduced by about 1 percent in median flow years if the Montana projects were developed.

The Poplar River contributes about 1.3 percent of the average annual streamflow and chemical load of the Missouri River near Culbertson (less in dry years). Because of this, the effects of consumptive use of Poplar River water on the Missouri River are small. Groundwater development in Sheridan County would similarly have a small effect on water quality in the Missouri River.

Within the Little Missouri subbasin, consumptive flow depletion in dry years would increase total dissolved solids and sodium adsorption ratios, and irrigation development would require careful application of water and special management to minimize decline in soil productivity and crop yields. Reduction in summer streamflow would increase the frequency of no flow and could raise water temperatures, lower dissolved oxygen, and thereby harm aquatic life.

SOILS

In general, reservations that would result in the conversion of riparian areas or rangeland to irrigated cropland would affect soils through the loss of organic matter, reduced water-holding capacity, and increased susceptibility to erosion. These effects would be somewhat offset once an alfalfa crop is established. Where reservations convert dry cropland to irrigation, soil structure will improve, wind and water erosion will decrease, and nitrogen and organic fertility will increase. Projects that might have substantial adverse soil impacts are identified in Chapter Six of the draft EIS. Other effects of consumptive use projects on soils are generally minor.

STREAM CHANNEL FORM

Impacts to stream channels generally would be minor. In some instances, consumptive water uses could decrease channel capacity by increasing the deposition of sediment. Instream reservations would not change existing stream channel forms. By trapping sediment and altering flow patterns, the proposed Battle Creek dam project (BL-181) could substantially alter stream channel characteristics in Battle Creek downstream.

VEGETATION

Impacts to vegetation would result from replacement of natural plant communities with agricultural crops, inundation of riparian and upland plant communities by reservoirs, reduced streamflows, lowered water tables, and increased proliferation of noxious weeds. Substantial losses to riparian vegetation would occur along the lower Missouri River under the Consumptive Use Alternative, where up to 8,956 acres would be lost, and Combination Alternative, where up to 8,404 acres would be lost. Wetlands near the Missouri River also would be lost under the Consumptive Use and Combination alternatives. The potential for loss of wetlands in the Sheridan County Groundwater Area due to lower water tables is a substantial concern under all alternatives but greatest under the Grant All Alternative.

LAND USE

Proposed irrigation reservations would convert nonirrigated cropland, pasture, and rangeland to irrigated fields. Reservations would allow newly irrigated cropland to increase in the basin by about 22 percent (57,387 acres) under the Consumptive Use Alternative, 12 percent (32,106 acres) under the Combination Alternative, and 3 percent (7,363 acres) under the Instream Alternative. In the Sheridan County Groundwater Area, irrigated land could increase by 540 percent (42,600 acres) under the Grant All Alternative, 32 percent (2,400 acres) under the Partial Granting Alternative, and 70 percent (5,500 acres) under the Coordinated Groundwater Development Alternative. Thirty-seven irrigation projects may have other substantial land use impacts including pipelines, canals, and transmission lines. These are identified in Chapter Six of the draft EIS. Other land use impacts are generally minor.

FISH AND AQUATIC HABITAT

Low flow conditions already stress gamefish populations and aquatic habitat on some rivers and streams in the basin. Further consumptive uses would generally worsen conditions on these rivers and streams. Streams most severely affected by the proposed consumptive use reservations under the Consumptive Use Alternative include the Poplar River and East Fork Poplar River, Little Missouri River, Boxelder Creek, and Little Beaver Creek. Under the Grant All Alternative in the Sheridan County Groundwater Area, aquatic habitat could be reduced in Big Muddy Creek.

Streams where the effects could be less include the Missouri River and smaller ephemeral tributary streams. Stored water might be released from Fort Peck Reservoir to offset most water depletions in the lower Missouri River. Reservations for instream flows would help maintain the existing aquatic habitat and fisheries. It is unlikely that the proposed irrigation storage projects could support a fishery. On large irrigation projects, fish could be killed in the diversion structures, though this could be minimized through proper design.

Construction and operation of Fort Peck Dam have greatly modified habitat of pallid sturgeon, a federally listed endangered species that inhabits the Missouri River. The effects of proposed flow reductions would reduce habitat of the pallid sturgeon slightly. These reductions would be in addition to existing impacts caused by the dam.

WILDLIFE

Wildlife habitat would be reduced by conversion of native vegetation to cropland as described under the vegetation section. Draining of wetlands and lakes would reduce the amount of habitat available to waterfowl and shorebirds. Least terns, a federally listed endangered species, are found along the lower Missouri River, and piping plovers, a listed threatened species, are found along the lower Missouri River and beside saline lakes and ponds in the Sheridan County Groundwater Area. Reductions of flow or lowering of water tables could make these species and other waterfowl more vulnerable to predation, although such effects have not been quantified.

Farming operations could disturb nesting raptors, and cultivation could destroy grouse courtship and breeding areas. However, in most cases, site- specific information is not available to determine the extent of the effect, if any.

Adverse effects to wildlife habitat would be greatest under the Consumptive Use Alternative where 4,100 acres of native woodland (mostly riparian cottonwood habitat) and scrub/shrub habitats and 4,800 acres of native prairie and mixed prairie habitats would be cultivated along the lower Missouri River. Impacts would be lower under the Combination Alternative and slight under the Instream Alternative. In the Sheridan County Groundwater Area, water tables could be lowered the most and have the greatest effect under the Grant All Alternative and least under the Coordinated Groundwater Development Alternative.

In the Sheridan County Groundwater Area, habitat of the piping plover, a federally listed threatened species, could be affected by a lowering of water tables in wetlands used by these birds. Along the lower Missouri River, some projects are near areas known to be used by least terns or piping plovers and their nesting could be disturbed during project construction.

HISTORICAL, ARCHAEOLOGICAL, AND PALEONTOLOGICAL SITES

Proposed consumptive use reservations could affect up to 31 known historical or archaeological sites, although a small number of these are likely to contain information important to interpreting the past. No known paleontological sites would be affected. There is a moderate potential for discovery of historical, archaeological, and paleontological sites, particularly where projects would be developed on undisturbed rangeland. Most sites are located on private land where formal evaluation is not required to determine if the sites might be eligible for listing on the National Register of Historic Places, unless the Board would choose to do so as part of its approval of reservations. One exception would be burial locations which are known or are discovered during development of a reservation project. Montana law requires that such sites be protected.

STORAGE

Reservations may reduce water available for future storage projects. Existing water rights could be a greater constraint to the development of new storage than water reservations. The reservation applications include five water storage projects. Together, they could store up to 20,239 af/yr of water.

RECREATION

Instream reservations would help maintain streamflows on streams and rivers that are important to recreation. The small flow reductions that would occur in the Missouri River below Fort Peck Dam under any of the alternatives would have minor effects on recreation opportunities.

Flow increases resulting from the Virgelle project in the Milk River above Dodson during summer under all three alternatives might improve fishing and floating opportunities. If the Virgelle Diversion project is not constructed, fishing and floating opportunities in the Milk River would decrease slightly.

Under the Consumptive Use Alternative, dam operations on the Battle Creek project could improve stream fishing opportunities if habitat is improved and fish populations increase. While improved recreation is possible, seasonal reservoir drawdowns may limit the extent of the beneficial effects. New fishing or boating opportunities on the reservoir for Battle Creek Dam would be marginal due to repeated reservoir drawdowns for irrigation.

For the Poplar River, East Fork of the Poplar River, and prairie streams that support fish in the Little Missouri River drainage, already marginal fishing opportunities would decrease further under the Consumptive Use and Combination alternatives.

Possible effects at Medicine Lake National Wildlife Refuge from proposed pumping in the Sheridan County Groundwater Area include decreasing and changing locations available for wildlife observation and photography. Decreased water levels could further limit fishing opportunities in Big Muddy Creek and Medicine Lake.

Instream flow values for the middle Missouri and Marias/Teton subbasins (Duffield 1990) were used as approximate recreation values of an acre foot of flow on rivers and streams in the lower Missouri and Milk River subbasins. These values were $5.81 per acre foot for July and August flows and $1.63 per acre foot for flows during the rest of the year. The annual value of recreation losses (the recreational value per acre foot of flow multiplied by estimated changes in average streamflow for each alternative due to proposed reservations) is estimated to be $326,430 under the Consumptive Use Alternative, $183,863 under the Combination Alternative, and $14,526 under the Instream Alternative. The annual value of recreation losses could not be estimated in Sheridan County or in the Little Missouri River subbasin.

HYDROPOWER

Consumptive use reservations eventually would increase the cost of electricity to ratepayers. They would do this by: (1) decreasing streamflows that are used to generate electricity; and (2) requiring production of additional electricity. These two actions would require production of replacement power that would be considerably more expensive than power from existing supplies. The total monetary impact to ratepayers would range from $2.18 million to $5.60 million a year under the Consumptive Use Alternative, $1.20 million to $3.00 million a year under the Combination Alternative, and $0.13 million to $0.38 million a year under the Instream Alternative. Impacts to ratepayers because of reduced hydroelectric generation could not be estimated for projects in Sheridan County. The impacts to ratepayers because of increased electric power use from proposed projects in Sheridan County would range from $0.19 million to $1.14 million a year under the Grant All Alternative; $0.01 million to $0.05 million a year under the Partial Granting Alternative; and $0.02 million to $0.13 million a year under the Coordinated Groundwater Development Alternative.

AGRICULTURE

Development of irrigation projects in the basin under any alternative would have small beneficial effects on jobs, personal income, taxes, and agricultural sales. About 12 jobs would be created among the four subbasins under the Instream Alternative and about 100 under the Consumptive Use Alternative. Benefits would be greatest in the Sheridan County Groundwater Area where, if all projects could be developed, 56 jobs might be created. Personal income in the basin would increase between $0.02 million a year under the Instream Alternative to $1.6 million a year under the Consumptive Use Alternative. County tax receipts would increase between $58,000 a year under the Instream Alternative and $151,000 a year under the Consumptive Use Alternative. Agricultural sales would increase between 0.5 percent under the Instream Alternative and 4.2 percent under the Consumptive Use Alternative

SOCIAL EFFECTS

The reservations would not noticeably change the social character of communities in the Missouri River basin.

NO ACTION ALTERNATIVE

If the Board were to deny all reservation applications, consumptive water users could still apply through the water use permitting process to appropriate water for beneficial uses. A potential user also might be able to purchase water from tribes of the Fort Peck Indian Reservation or from existing water right holders. Municipalities could condemn existing water rights to meet needs when they occur in the future.

Some new irrigation projects would be built in the basin. However, the total acreage of irrigated land might remain stable as lower quality irrigated land goes out of production because of low crop prices and higher yields on good land.

If instream reservations are not granted, instream flows in many streams and rivers would not be protected by a water right. In some instances, increased consumptive uses could lead to streams becoming very low or going dry, resulting in adverse impacts to water quality, aquatic life, recreation, and wildlife. Tribal water rights and federal and state water quality standards for arsenic could provide some level of instream flow protection in some streams and rivers.

If present trends hold, few large storage projects will be built over the next 25 years. Emphasis during this period probably will be on rehabilitation and enlargement of existing facilities as defined in the state water plan.

OTHER REASONABLY FORESEEABLE ACTIONS

The U.S. Army Corps of Engineers is currently reviewing its master manual, which governs releases of water from Fort Peck and the system of downstream reservoirs it operates. The outcome of this review is not known, but could change flow patterns in the lower Missouri River. A draft EIS on this review is expected to be released in 1994, but a preferred alternative has been identified and is discussed further in Appendix A.

USFWS has issued a recovery plan for endangered pallid sturgeon inhabiting the lower Missouri River. This plan calls for a more natural flow pattern in the river. It is not known what effect this will have on releases from Fort Peck Reservoir.

Canada is entitled to a substantial portion of the Milk River and half the flow of Milk River tributaries originating in Canada. If Canadians use the water they are entitled to and all requested reservations are granted, flows in the Milk River could be substantially reduced, and flows in the lower Missouri River would be reduced slightly. Shortages of water for irrigation along the Milk River would increase, and some irrigated land might go out of production. Impacts to water quality, aquatic habitat, and water-based recreation also would increase.

If the Virgelle Diversion--a reservation for this project was approved during the upper basin reservation proceeding--is not constructed and Canadian and Indian water entitlements are fully developed in the future, a significant reduction in flow of the Milk River would occur. Under these conditions, chemical concentrations (salinity) of the Milk River would increase to the point that water is unsuited for irrigation use. Physical water quality may further decline with increases in temperature and turbidity and a reduction in dissolved oxygen. Concentrations of cadmium, iron, lead, and manganese in the Milk River at Nashua would approach or exceed the public drinking water standard more frequently.

Under the Fort Peck Compact between the tribes of the Fort Peck Indian Reservation and the State of Montana, the tribes may use up to 475,000 af/yr of water from the Missouri River. The majority of this water would be used during the summer, but it is uncertain how the water would be used or where it would be diverted. (Please see page 41 of the draft EIS for a more detailed discussion of the Fort Peck Compact.) The cumulative effects on the lower Missouri River from the proposed reservations and the Fort Peck Compact might be reductions in flow, water quality, aquatic habitat, and recreational opportunities. Any such impacts would be in addition to those caused by state water reservations.

Reductions in streamflow due to the combined use by the Canadians, tribes of the Fort Peck Indian Reservation, and state water reservations could cause total dissolved solids and trace-element concentrations in the Missouri River to frequently exceed water quality standards and criteria for public drinking water, and might limit the suitability of the water for irrigation. Flow reductions probably would be accompanied by thermal increases and reduced dissolved oxygen concentrations harmful to aquatic life.

BOARD DECISION CRITERIA

The decision of whether to grant, modify, or deny the reservation applications rests with the Board, which must abide by several criteria that are discussed below. The ability of the requested reservations to meet these criteria is examined in DNRC's research and analyses of the reservation applications, as explained in Chapter Seven of the draft EIS. Whether any reservation request fully satisfies criteria will be determined by the Board, based on the hearing record.

QUALIFICATION AND PURPOSE

The Board must determine (a) that of those who applied for reservations, all are qualified to reserve water through the Missouri River basin water reservation proceeding; and (b) the stated purposes for all reservations requested are beneficial uses under Montana law.

NEED

The regulation states that a water reservation is needed if "there is a reasonable likelihood that future instate or out-of-state competing water users would consume, degrade, or otherwise affect the water available for the purpose of the reservations," or if "there are constraints that would restrict the applicant from perfecting a water permit for the intended purpose of the reservation." All applicants identified a purported need to reserve water. Conservation districts want to secure water for agricultural production before the water is appropriated by other users in Montana or by downstream states. They also want to have the option to develop this water when the economic climate improves. Municipalities want to appropriate water to meet future growth when available water supplies are diminishing in the basin. DFWP wants secure instream flows to protect fish, wildlife, recreation, and water quality.

AMOUNT

The Board must determine the amount needed to fulfill the purpose of the reservations. This amount must be based on accurate and suitable measuring methods and determinations that no reasonable cost-effective measures could be taken within the reservation term to increase efficiency and lessen the amount of water required.

Conservation districts' requests are based on recorded crop requirements and efficiency of proposed irrigation systems. Many of the projects were designed for efficient sprinkler irrigation.

Municipalities requested enough water to service population growth to the year 2035. Increased population multiplied by per capita rate of consumption was used to calculate the total amount requested in the applications. Per capita rates were based on actual use requirements for each community. Population projections based on the 1990 census indicate that population growth and the associated amounts of water requested by 14 of the municipalities may be higher than expected.

DFWP used several methods to determine its instream flow reservation requests. These methods are summarized in Appendix C of the draft EIS.

PUBLIC INTEREST

Reservations for municipal water supplies and irrigation would provide monetary benefits to basin communities. However, they would decrease streamflows which could adversely affect recreation and hydropower production. Reservations for consumptive uses also would use additional power, which would eventually require the production of higher cost electricity. The value of an acre-foot of water for instream flow is based on recreation and electricity production. Table S-2 identifies the total benefits and costs of water uses under the three alternatives. Excluding the Sheridan County Groundwater Area, net benefits per year are greatest under the Instream Alternative ($37.85 million), less under the Combination Alternative ($31.29 million), and considerably lower under the Consumptive Use Alternative ($12.71 million). Benefits and costs to recreation and hydropower production could not be estimated in the Sheridan County Groundwater Area.

Municipal water developments have benefits that exceed costs by $37.79 million because of the small amount of water consumed and the high value of this use under all three alternatives (Table S-3). This assumes that the proposed water use is actually needed by the municipalities. In contrast, proposed irrigation projects would consume large amounts of water. Total costs associated with the depletions would exceed total benefits by $25.08 million a year under the Consumptive Use Alternative and $6.51 million a year under the Combination Alternative. However, total benefits exceed total costs by $0.06 million a year under the Instream Alternative (Table S-3).

The value of an acre-foot of water for instream and consumptive uses can be compared when there is only enough water for one type of use. Outside of the Sheridan County projects, 54 proposed irrigation projects would value an acre-foot of water at a greater level than the instream values, and 109 proposed irrigation projects would value water less than the instream values. This assumes a 5 cents/kWh cost for replacement power and a 10-year-in-10 water availability. The value of an acre-foot of water for all municipal reservations exceeds the value of water for instream flow and proposed irrigation projects.

On each stream or stream reach, the number of requests that will give the greatest net benefit is based, in part, on the amount of water available. However, water availability may not be definitely known before the Board acts on the reservation requests.

Table S-2. Benefits and costs of water use under six alternatives ($ million)[a]

	Consumptive Use	Combination	Instream	GAA	PGA	CGDA
Irrigation	25.69	20.82	1.60	23.88	2.07	3.85
Municipal	39.36	39.36	39.36	3.67	3.67	3.67
Recreation	-6.81	-3.84	-0.30	unk	unk	unk
Hydropower production	-39.05	-21.94	-2.21	unk	unk	unk
Replacement power	-6.48	-3.12	-0.60	-3.96	-0.18	-0.47
Total	12.71	31.29	37.85	23.59	5.56	7.06

GAA = Grant All Alternative, PGA - Partial Granting Alternative,
CGDA = Coordinated Groundwater Development Alternative (only for Sheridan County)

[a] Positive numbers represent net benefits, and negative numbers represent net costs.
All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate.

Table S-3. Benefits and costs of reservations for irrigation and municipal uses ($ million)[a]

	Consumptive Use	Combination	Instream	GAA	PGA	CGDA
Irrigation						
benefits	25.69	20.82	1.60	23.88	2.07	3.85
costs	-50.77	-27.33	-1.54	unk	unk	unk
net	-25.08	-1.51	0.06	unk	unk	unk
Municipal						
benefits	39.36	39.36	39.36	3.67	3.67	3.67
costs	-1.57	-1.57	-1.57	unk	unk	unk
net	37.79	37.79	37.79	unk	unk	unk

GAA = Grant All Alternative, PGA = Partial Granting Alternative,
CGDA = Coordinated Groundwater Development Alternative (only for Sheridan County)

[a] Positive numbers represent net benefits, and negative numbers represent net costs.

All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate.

CHAPTER ONE

INTRODUCTION

In 1985, the Montana Legislature directed the Department of Natural Resources and Conservation (DNRC) to initiate and coordinate a proceeding that would allow public entities (state and federal agencies and subdivisions of the state) to reserve water in the Missouri River basin of Montana for future use. This reservation proceeding was initiated for two reasons. First, it was thought that the comprehensive planning required in a reservation process would encourage more efficient development of the water resources in the basin. Second, the reservation proceeding was seen as a way to build a strong legal basis for protecting Montana's share of Missouri River water in any future litigation with other states or in a congressional apportionment of the water between states.

The legislature was particularly concerned that downstream states might litigate for the guaranteed delivery of Missouri River flows from Montana. Montana can best prepare for negotiation or litigation by identifying its present and future water needs and legally reserving water in amounts sufficient to meet those needs.

In reservation proceedings, local governments, conservation districts, and state and federal agencies are encouraged to apply to reserve water for existing and future water-consuming uses or to maintain a minimum flow, level, or quality of water (§85-2-316, MCA). Under the law, DNRC is responsible for assisting in preparing the reservation applications and for coordinating the reservation process. The Board of Natural Resources and Conservation (Board), a governor-appointed group of seven citizens, decides whether to grant, deny, or modify reservation requests. The Board's decisions on reservation applications in the Missouri River basin will be based on a record of evidence that includes the information provided in the applications, environmental impact statement, and a contested case hearing.

Due to the vast size of this basin, the Missouri River reservation proceeding has been split into two parts. Applications for water reservations in the upper portion of the basin, which encompasses the drainage area upstream from Fort Peck Dam, were considered first. After an environmental review and contested case hearing, the Board made a final decision on the upper basin applications in June 1992.

Following the Board's upper basin decision, a draft environmental impact statement (EIS) was developed which addressed applications for the reservation of water in the Missouri River basin in Montana below Fort Peck Dam. The legislature required applications for water in the basin below Fort Peck Dam, including the Little Missouri River and Milk River basins (Map 1-1), to be submitted to DNRC by July 1, 1991. The Board has until December 31, 1994, to act on applications for reservations in the lower Missouri, Milk, and Little Missouri River basins. Any reservation granted in these basins will receive a priority date of July 1, 1985. The priority date for any reservations granted in the Little Missouri River basin will be July 1, 1989.

EIS PROCESS

The draft EIS was prepared to satisfy the Montana Water Use Act and the Montana Environmental Policy Act (MEPA). MEPA requires that an EIS be prepared to address government actions that might significantly affect the quality of the environment. DNRC determined that the reservation applications would require an EIS. The draft EIS provided information for the Board to use in deciding whether it should grant, modify, or deny water reservations that have been applied for in the lower Missouri River basin. It also served to inform the public of the possible consequences of any action by the Board on the pending water reservation applications.

All pending water reservations requested in the Milk River basin, Little Missouri River basin, Sheridan County Groundwater Area, and Missouri River basin below Fort Peck Dam were addressed in the draft EIS, which also described in general terms the reservation requests and the parties and resources that would be affected if the requests are granted. Effects in the lower Missouri River basin due to reservations granted above Fort Peck Dam also were taken into account. Significant, basinwide issues and the cumulative effects of granting the reservations were the main focus of the draft EIS.

The public had several opportunities to participate in the EIS process. In the first of these, public meetings were held at five locations during the fall of 1992 to help determine the issues that should be examined in the EIS. These issues, along with information from state and federal agencies, were combined with research results and other data to form the draft EIS. In February of 1994 the draft EIS was distributed to the public to give interested parties the opportunity to review it and comment. During this review period, DNRC also held five public meetings to gather written and oral comments on the draft EIS. This final EIS responds to comments and provides information on issues raised following publication of the draft EIS.

CONTESTED CASE HEARING

While the final EIS was being prepared, DNRC issued legal notice of the reservation applications to all potentially affected water right holders and other interested parties. Written objections to the the applications then were submitted to DNRC. The Board appointed a hearings examiner to hold a formal contested case hearing. The hearing will be held during September of 1994. Applicants and objectors will present testimony and evidence at the hearing, which is the final opportunity for public involvement in the reservation process. Based on its review of the record developed at the hearing, the Board will issue a decision to fully grant, partially grant, modify, or deny requested reservations.

WHO HAS APPLIED

DNRC received 26 reservation applications for water in the lower basin. Fourteen municipalities applied for 46,167 acre-feet a year to meet future growth. Eleven conservation districts requested 276,407 acre-feet a year primarily for 472 proposed irrigation projects covering 157,994 acres. The Montana Department of Fish, Wildlife and Parks (DFWP) applied to reserve instream flows on 21 streams or stream reaches to protect fish, wildlife, recreation, and water quality. A more detailed discussion of the applicants' requests was presented in Chapter Three of the draft EIS. Tables 1-1 through 1-3 identify the amount of water requested by each applicant, and maps 1-2 through 1-9 show the points of diversion for proposed conservation district projects, the stream reaches for which DFWP has requested instream flow reservations, and the municipalities applying to reserve water.

Map 1-1. Lower Missouri River Basin and Subbasins

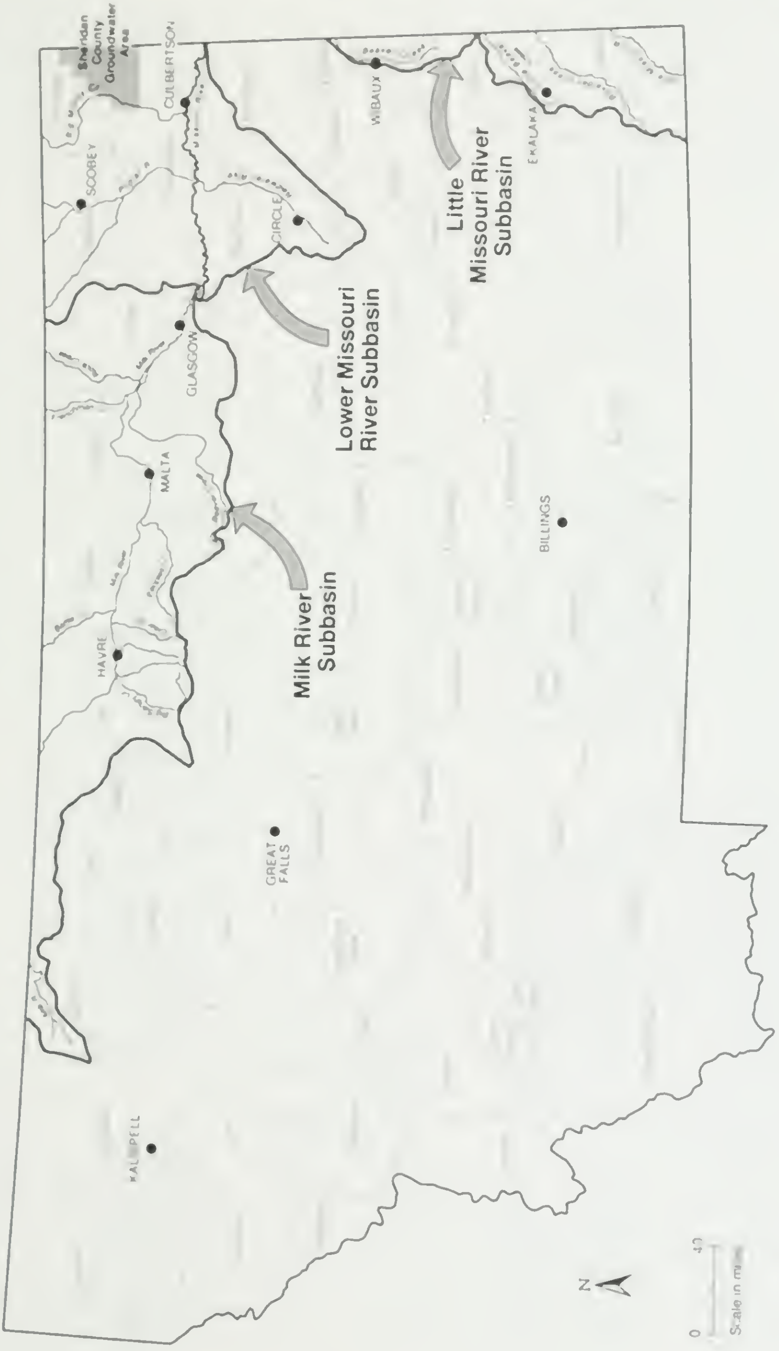


Table 1-1. Conservation District Reservation Requests

Project Number		Dam Location		Maximum Storage (af)	Annual Diversion (af)	Water Source	Project Acres
	TWN	RGE	SEC				
Blaine County Conservation District							
BL-131	35N	26E	13	169	164	Tributary Black Coulee	70
BL-171	35N	18E	14	172	172	Link Coulee/Battle Creek	71
BL-181	36N	18E	16	18,593	10,600	Battle Creek	6,000
TOTALS				18,934	10,936		6,141

Project Number		Point of Diversion		Peak Flow (cfs)	Annual Use (af)	Water Source	Project Acres
	TWN	RGE	SEC				
Carter County Conservation District							
CT-011	7S	60E	16	5.0	425	Little Missouri River	157
CT-012	7S	60E	16	a	260	North Butte Creek	173
CT-041	2N	57E	33	a	195	Little Beaver Creek	130
CT-071	2N	57E	13	1.3	186	Little Beaver Creek	80
CT-121	1S	60E	4	2.8	255	Boxelder Creek	94
CT-122	1S	60E	9	a	90	Lampkin Gulch	60
CT-131	6S	62E	11	2.4	240	Little Missouri River	88
CT-141	8S	58E	14	a	120	UT Long Draw	80
CT-151	4S	58E	25	a	54	Sherril Creek	36
CT-152	4S	59E	30	a	17	UT Boxelder Creek	11
CT-153	5S	58E	13	a	84	Hawksnest Creek	56
CT-154	4S	59E	27	a	14	UT Boxelder Creek	9
CT-161	7S	62E	34	a	42	Elkhorn Creek	28
CT-162	7S	62E	34	a	50	UT Elkhorn Creek	33
CT-171	1S	58E	22	a	165	Fresh Water Draw	110
CT-181	5S	62E	21	a	225	Cottonwood Creek	150
CT-191	7S	61E	1	3.8	247	Little Missouri River	91
CT-221	1S	60E	17	2.5	311	Boxelder Creek	115
CT-241	6S	62E	15	2.6	269	Little Missouri River	99
CT-243	6S	62E	36	a	9	UT Beaver Creek	6
CT-244	6S	62E	24	a	105	N.F. Beaver Dam Creek	70
CT-251	1N	61E	16	3.1	290	Boxelder Creek	107
CT-261	6S	58E	13	a	20	UT East L O Creek	13
CT-262	6S	58E	14	a	3	UT L O Creek	2
CT-291	3N	59E	3	a	30	UT Little Beaver Creek	20
CT-293	3N	59E	5	a	8	UT Little Beaver Creek	5
CT-294	3N	59E	6	0.4	50	Groundwater	22
CT-301	2N	57E	28	a	390	Little Beaver Creek	260
CT-310	1N	59E	35	a	45	UT Boxelder Creek	30
CT-320	6S	57E	4	0.3	39	Boxelder Creek	17
CT-330	2S	60E	7	1.0	130	Boxelder Creek	48
CT-340	3N	58E	35	a	173	HS Creek	115
CT-370	1S	60E	3	0.9	107	Boxelder Creek	39
CT-380	4S	59E	3	0.2	36	Boxelder Creek	13
TOTALS				26.3	4,684		2,367
Daniels County Conservation District							
DA-21	36N	50E	21	a	38	S.F. Whitetail Cr.	25
DA-31	34N	45E	6	1.4	208	Groundwater	89
DA-32	34N	45E	8	0.6	92	Groundwater	40
DA-51	34N	48E	35	0.5	68	Poplar River	25
DA-71	35N	46E	26	3.5	502	Groundwater	215
DA-131	37N	46E	17	a	122	UT M.F. Poplar	81
DA-151	35N	48E	20	2.2	316	Groundwater	135
DA-152	35N	48E	16	a	9	UT Poplar River	6
DA-153	35N	48E	29	a	119	UT Poplar River	79
DA-161	35N	45E	26	0.2	32	Police Creek	11

Project Number	Point of Diversion			Peak Flow (cfs)	Annual Use (af)	Water Source	Project Acres
	TWN	RGE	SEC				
DA-181	37N	46E	9	a	120	UT M.F. Poplar R.	80
DA-182	37N	46E	15	a	45	UT M.F. Poplar R.	30
DA-211	37N	48E	19	0.8	82	E.F. Poplar River	35
DA-221	35N	46E	22	2.2	320	Spring, Olsen Coulee	137
DA-251	37N	45E	20	0.7	95	Springs, Coal Cr.	67
DA-252	37N	45E	19	1.1	156	Springs, Coal Cr.	41
DA-261	34N	48E	10	1.1	158	Poplar River	66
DA-281	37N	47E	13	2.0	235	Groundwater	87
DA-291	37N	47E	36	a	228	UT E.F. Poplar R.	152
DA-341	T35N	R48E	5	0.6	84	Poplar River	36
DA-371	T37N	R45E	27	a	3	UT Butte Creek	2
TOTALS				16.9	3,032		1,439
Liberty County Conservation District							
LI-241	T37N	R7E	29	0.84	122	Lost Coulee	50
Little Beaver Conservation District							
LB-011	11N	60E	25&30	a	116	Rattlesnake Creek	77
LB-041	10N	60E	19	a	24	Spring Creek	16
LB-061	5N	60E	19	a	90	UT Little Beaver Creek	60
LB-063	5N	60E	29	a	14	UT Little Beaver Creek	9
LB-083	4N	59E	33	a	75	Bone Pile Creek	50
LB-121	9N	61E	4	a	146	Beaver Creek	97
LB-141	4N	61E	10&15	a	218	Mud Creek	145
LB-151	5N	58E	36	a	114	UT Duck Creek	76
LB-161	9N	60E	2	a	408	Fork of Beaver Creek	272
LB-171	10N	61E	7	a	45	UT E.F. Beaver Creek	30
LB-172	10N	61E	18	a	18	UT E.F. Beaver Creek	12
LB-181	7N	61E	5	a	17	UT Dugout Creek	11
LB-182	8N	61E	34	a	38	UT Dugout Creek	25
LB-191	10N	60E	8&9	a	225	Beaver Creek and UT	150
Stockwater	—	—	—	a	300	—	
TOTALS					1,848		1,030
McCone Conservation District							
MC-01	27N	41E	35	3.6	501	Missouri River	214
MC-03	26N	43E	9	5.6	807	Missouri River	346
MC-04	26N	44E	7	1.8	265	Missouri River	114
MC-05	26N	44E	16	4.8	696	Missouri River	298
MC-5A	26N	44E	10	5.9	858	Missouri River	367
MC-06	26N	45E	17	4.8	698	Missouri River	298
MC-6A	26N	45E	10	1.8	257	Missouri River	111
MC-08	26N	46E	1	20.7	2,989	Missouri River	1,279
MC-09	27N	47E	34	5.5	798	Missouri River	342
MC-9A	27N	47E	22	0.4	57	Missouri River	25
MC-10	27N	47E	24	5.6	812	Missouri River	349
MC-11	27N	50E	21	14.7	2,128	Missouri River	911
MC-12	26N	45E	13	8.9	1,246	Missouri River	536
MC-99	26N	46E	11	15.2	2,187	Missouri River	934
TOTALS				99.3	14,299		6,124
Richland County Conservation District							
RI-01	27N	51E	21	26.0	3,667	Missouri River	1,550
RI-02	26&27N	51E	26	4.6	651	Missouri River	278
RI-03	27N	51E	24	13.2	1,896	Missouri River	810
RI-04	27N	52E	31	3.3	472	Missouri River	202
RI-05	27N	52E	21	8.8	1,230	Missouri River	526
RI-06	27N	52E	23	6.8	972	Missouri River	416
RI-07	28N	53E	31	19.5	2,441	Missouri River	1,029
RI-08	27N	53E	3	5.3	658	Missouri River	277

Project Number	TWN	Point of Diversion RGE	SEC	Peak Flow (cfs)	Annual Use (af)	Water Source	Project Acres
RI-09	27N	54E	6	15.1	2,188	Missouri River	935
RI-10	27N	54E	12	11.1	1,519	Missouri River	643
RI-11A	28N	55E	34	3.1	441	Missouri River	189
RI-11	27N	55E	1	11.1	1,606	Missouri River	686
RI-12	27N	56E	3	11.8	1,635	Missouri River	782
RI-13	27N	57E	28	6.0	835	Missouri River	399
RI-14	26N	58E	6	17.0	2,128	Missouri River	1,003
RI-15	26N	59E	5	23.3	3,010	Missouri River	1,416
TOTALS				186.0	25,349		11,141
Roosevelt Conservation District							
CBI-1	27N	49E	13	11.8	2,121	Missouri River	929
CBI-2	27N	49E	15	18.4	2,435	Missouri River	1,065
CBI-3	27N	49E	13	29.2	4,190	Missouri River	1,911
CBI-4	27N	50E	23	37.2	4,451	Missouri River	898
CBI-5	27N	51E	18	6.7	570	Missouri River	182
CBI-6	27N	51E	21	5.1	677	Missouri River	258
CBI-7	27N	51E	25	22.2	2,191	Missouri River	784
CBI-8	27N	52E	19	3.4	449	Missouri River	164
CBI-9	27N	52E	16	5.6	646	Missouri River	238
CBI-10	27N	53E	6	19.4	2,096	Missouri River	770
CBI-11	27N	53E	2	40.8	4,084	Missouri River	1,640
CBI-12	28N	54E	32	31.8	3,939	Missouri River	1,448
CBI-13	27N	56E	4	231.6	33,157	Missouri River	9,175
CBI-14	27N	56E	4	4.4	609	Missouri River	291
CBI-15	27N	55E	1	15.2	1,504	Missouri River	618
CBI-16	27N	58E	27	17.3	2,380	Missouri River	1,114
CBI-17	27N	57E	28	9.8	1,351	Missouri River	627
CBI-18	27N	58E	26	25.3	3,442	Missouri River	1,592
CBI-19	27N	58E	26	9.0	1,217	Missouri River	549
CBI-20	26N	59E	5	3.9	548	Missouri River	262
CBI-21	26N	59E	15	10.8	1,058	Missouri River	464
TOTALS				558.9	73,115		24,979
Valley County Conservation District							
VA-01	26N	41E	8	1.2	176	Missouri River	75
VA-02	27N	41E	34	16.1	2,325	Missouri River	995
VA-03	27N	42E	31	15.3	2,203	Missouri River	933
VA-71	27&28N	41E	2	4.1	590	Milk River	253
VA-171	35N	39E	36	2.3	337	Well	144
VA-211	28N	39E	24	1.6	226	Milk River	98
VA-231	27N	41E	25	5.2	745	Missouri River	320
VA-261	27&28N	41E	1	2.5	365	Milk River	157
VA-291	28N	39E	14	3.8	412	Milk River	151
VA-521	28N	41E	30	2.0	289	Milk River	124
TOTALS				54.1	7,668		3,250
Wibaux Conservation District							
WI-41	11N	59E	1	a	39	UT Beaver Creek	26
WI-42	11N	59E	1	a	152	UT Beaver Creek	101
WI-43	11N	60E	7	a	111	UT Beaver Creek	74
WI-61	12N	61E	28	a	18	UT Beaver Creek	12
WI-71	11N	60E	34	a	21	UT Beaver Creek	14
WI-72	10N	60E	4	a	12	UT Beaver Creek	8
WI-73	10N	60E	4&5	a	150	E.F. Beaver Creek	100
WI-74	11N	61E	31	a	95	E.F. Beaver Creek	63
WI-75	11N	60E	8	a	87	UT Beaver Creek	58
WI-91	11N	60E	30	a	75	Beaver Creek	50
WI-92	11N	60E	30	a	78	Rattlesnake Creek	52

Project Number	Point of Diversion TWN	RGE	SEC	Peak Flow (cfs)	Annual Use (af)	Water Source	Project Acres
WI-93	11N	59E	36	a	9	UT Beaver Creek	6
WI-121	13N	59E	35	a	41	UT Beaver Creek	27
WI-151	14N	60E	21	a	120	Yates Creek	80
WI-161	14N	60E	14	a	33	UT Hay Creek	22
WI-162	14N	60E	24	a	9	UT Yates Creek	6
WI-171	13N	59E	15	a	38	Spring Creek	25
WI-181	10N	60E	1	a	90	E.F. Beaver Creek and UT	60
WI-191	13N	59E	26	a	38	UT Beaver Creek	25
WI-192	13N	59E	28	a	15	UT Beaver Creek	10
WI-201	11N	61E	6	a	110	Lamesteer Creek	73
WI-202	11N	61E	6	a	66	UT Lamesteer Creek	44
WI-211	13N	60E	6	a	44	UT Beaver Creek	29
WI-221	12N	61E	32	a	11	UT Lamesteer Creek	7
WI-232	13N	59E	4	a	32	UT Beaver Creek	21
WI-233	13N	59E	9	a	29	UT Beaver Creek	19
WI-234	12N	60E	9	a	98	Lamesteer Creek	65
WI-235	13N	59E	26	a	39	UT Beaver Creek	26
WI-236	13N	59E	34	a	59	UT Beaver Creek	39
WI-237	13N	60E	18&19	a	48	Duck Creek	32
TOTALS					1,767		1,174

Sheridan County Conservation District

The Sheridan County Conservation District has applied to reserve 133,587 acre-feet/year of groundwater. This water would be allocated on a first-come, first-served basis to farmers and ranchers in the district. The district has identified 308 potential projects where the water could be used. The amounts applied for by groundwater source are as follows:

Groundwater Source	Annual Diversion (af)
Westby-Dagmar Channel	99,174.82
Big Muddy Channel	4,251
Tributary Outwash Channels	7,924
Pre-Glacial Missouri Channel	11,931.18
Terrace Deposit Channel	579
Coalridge and Sand Creek Channels	482
Recharge Channels	9,245
TOTAL	133,587

Sheridan County Conservation District Projects

Project Number	--Point of Diversion-- TWN	RGE	SEC	Annual Diversion (af)	Project Acres
2.1	32	58	6	457	146
3.1	33	57	21	482	154
4.1	33	56	32	482	154
4.2	33	56	25	313	100
6.1	32	58	10	482	154
8.1	33	58	18	482	154
9.1	33	58	31	329	105
9.2	32	58	22	482	154
10.1	32	58	35	482	154
10.2	32	56	26	482	154
11.1	32	56	18	344	110
11.2	32	56	17	704	225
11.3	32	56	17	579	185
11.4	32	56	17	585	187
11.5	32	56	18	329	105
11.6	32	56	7	423	135
14.1	34	58	13	404	129
14.2	34	58	13	407	130
14.3	35	58	24	516	165

a - Water spreading projects where no peak flow has been requested
UT - Unnamed tributary
af - acre-feet
cfs - cubic feet per second

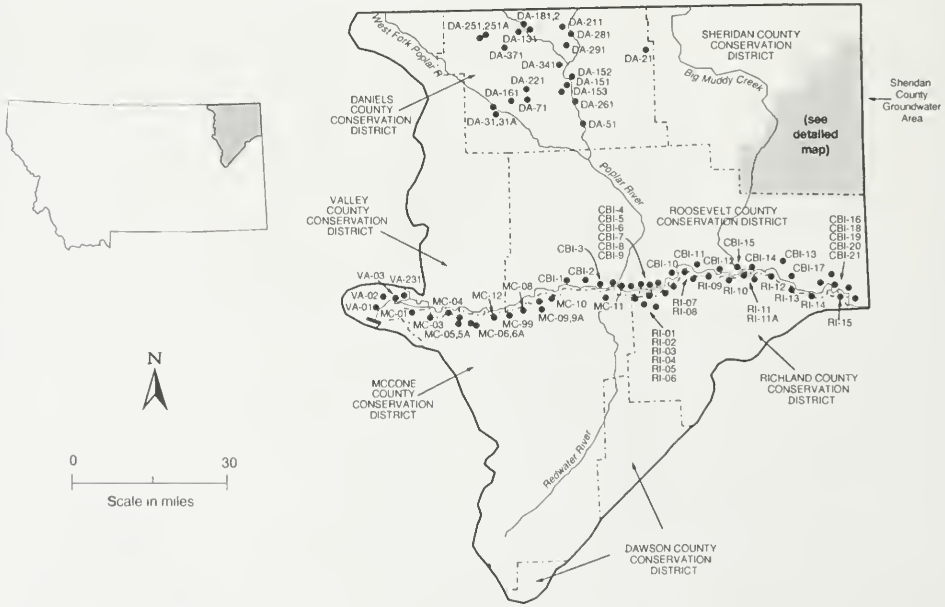
Project Number	--Point of Diversion--			Annual Diversion (af)	Project Acres
	TWN	RGE	SEC		
14.4	35	58	25	516	165
14.5	34	58	24	704	225
14.6	34	58	36	250	80
14.7	34	58	36	482	154
14.8	34	58	36	482	154
14.9	34	58	36	501	160
15.1	32	57	12	482	154
15.2	32	57	12	463	148
15.3	32	57	11	482	154
17.1	33	58	4	344	110
17.2	33	58	4	313	100
18.1	33	58	20	482	154
18.2	33	58	20	482	154
19.1	32	58	9	482	154
19.2	33	58	32	125	40
20.1	33	58	1	423	135
20.2	33	58	1	488	156
20.3	33	58	2	516	165
21.1	34	58	29	501	160
21.2	34	58	29	344	110
21.3	34	58	20	501	160
22.1	32	58	4	482	154
22.2	32	58	4	482	154
22.5	32	58	5	0.9	NA
23.1	33	58	1	532	170
23.2	33	58	12	432	138
23.3	33	58	12	250	80
23.4	33	58	14	482	154
23.5	33	58	2	551	176
26.1	31	57	2	482	154
28.1	32	56	29	460	147
28.2	32	56	29	463	148
28.3	32	56	27	470	150
30.1	31	56	33	460	147
30.2	31	56	33	463	148
30.3	31	56	28	482	154
30.4	31	56	33	463	148
30.5	31	56	33	482	154
30.6	31	56	34	482	154
30.7	31	56	34	482	154
30.8	31	56	32	482	154
30.9	31	56	31	482	154
30.10	31	56	31	404	129
32.1	33	58	21	501	160
32.2	33	58	21	501	160
32.3	33	58	30	235	75
33.1	32	57	1	501	160
34.1	32	57	21	482	154
34.2	32	57	16	482	154
34.3	32	57	21	482	154
35.1	34	57	23	482	154
36.1	32	57	2	482	154
37.1	32	57	26	485	155
38.1	33	58	20	482	154
38.2	33	58	11	482	154
38.3	33	58	12	460	147
39.1	33	58	29	250	80
39.2	32	57	20	482	154
39.3	32	57	20	463	148
39.4	32	57	19	482	154
39.5	32	57	20	463	148
39.6	33	57	13	463	148
40.1	33	58	20	482	154
40.2	33	58	28	457	146
40.3	32	58	7	460	148
40.4	33	58	19	360	115
42.1	32	56	19	501	160
42.2	32	56	28	482	154
42.3	32	56	28	482	154
42.4	32	56	19	501	160
42.5	32	56	27	344	110
44.1	31	56	32	482	154
44.2	31	56	32	482	154
44.3	31	56	32	429	137
45.1	31	56	27	391	125
45.2	31	56	27	482	154
45.3	31	56	28	482	154
47.1	31	57	2	482	154
47.2	31	57	3	482	154
47.3	31	57	3	250	80
47.4	31	57	9	751	240
47.5	31	57	9	376	120
54.1	33	58	17	482	154
57.1	32	56	26	482	154
58.1	32	56	24	482	154
59.1	31	56	28	485	155
59.2	31	56	25	432	138
59.3	31	56	25	457	146
59.4	31	56	24	482	154
59.5	31	56	24	460	147
59.6	31	57	30	460	147
59.9	31	57	30	1.8	NA
62.1	34	58	32	250	80
62.2	33	58	5	532	170
62.3	33	57	1	463	148
62.4	33	58	6	482	154
62.5	33	58	6	391	125
62.6	33	58	6	297	95
63.1	32	56	34	482	154
64.1	32	57	30	451	144
64.2	32	57	30	451	144
64.3	32	56	27	482	154
67.1	32	57	21	463	148
68.1	31	55	26	579	185
68.2	31	55	22	344	110
68.3	31	55	26	516	165
71.1	32	56	30	297	95
71.2	32	56	27	570	182
73.1	33	58	8	250	80
73.2	33	58	8	423	135
73.3	33	58	9	407	130
75.1	31	55	14	482	154
75.2	31	55	14	482	154
75.3	31	55	14	482	154
75.4	31	55	11	141	45
77.1	33	57	19	482	154
78.1	32	56	5	501	160
78.2	32	56	8	482	154
78.3	32	56	25	482	154
81.1	32	58	19	482	154

Project Number	–Point of Diversion–			Annual Diversion (af)	Project Acres
	TWN	RGE	SEC		
81.2	32	58	21	482	154
81.3	32	58	21	463	148
81.4	32	58	20	482	154
81.5	32	58	20	219	70
82.1	32	57	1	470	150
82.2	32	57	1	501	160
82.3	33	57	21	482	154
83.1	33	57	26	482	154
84.1	32	57	14	376	120
84.2	32	57	29	250	80
85.1	32	58	30	401	128
85.2	32	58	30	407	130
85.3	32	58	30	376	120
85.4	32	58	27	438	140
85.5	32	58	28	460	147
85.6	32	58	28	460	147
85.7	32	58	29	482	154
85.8	32	58	29	438	140
85.9	32	58	29	482	154
85.10	32	57	25	376	120
85.11	32	57	26	203	65
85.12	32	57	26	250	80
85.13	32	56	26	482	154
86.1	32	56	2	516	165
87.1	33	58	13	313	100
87.2	33	58	13	313	100
88.1	33	58	13	482	154
88.2	33	58	24	344	110
88.3	33	58	13	482	154
89.1	33	58	12	516	165
89.2	33	58	12	407	130
90.1	34	58	1	532	170
90.2	34	58	28	482	154
90.3	34	58	21	482	154
90.4	34	58	28	482	154
90.5	34	58	1	532	170
90.6	34	58	21	407	130
90.7	34	58	34	482	154
92.1	32	58	21	470	150
94.1	33	58	32	200	64
94.2	32	58	10	376	120
94.3	32	58	2	516	165
94.4	33	58	8	482	154
100.1	32	57	12	482	154
100.2	32	57	12	482	154
100.3	32	57	11	482	154
100.4	32	57	10	203	65
100.5	32	57	11	404	129
103.1	36	58	35	482	154
103.2	36	58	35	391	125
104.1	34	58	10	438	140
105.1	33	58	35	482	154
105.2	33	58	34	288	92
105.3	32	58	1	482	154
105.4	33	58	35	401	128
105.5	33	58	35	482	154
105.6	33	58	35	250	80
106.1	34	58	22	219	70
106.2	34	58	27	460	147
106.3	34	58	27	363	116
108.1	35	58	35	482	154
110.1	35	58	26	482	154
112.1	31	56	27	482	154
112.2	31	56	35	460	147
112.3	31	56	35	344	110
115.1	33	58	26	516	165
116.1	32	58	10	482	154
116.2	32	58	22	532	170
116.3	32	58	10	404	129
116.4	32	58	20	407	130
118.1	36	58	33	423	135
118.2	36	58	27	376	120
118.3	36	58	28	313	100
122.1	36	57	35	460	147
122.2	32	58	5	482	154
123.1	33	58	30	463	148
123.2	33	57	25	463	148
124.1	34	58	1	482	154
124.2	34	58	1	482	154
124.3	35	58	24	482	154
124.4	35	58	24	482	154
127.1	36	58	36	407	130
127.2	36	58	36	370	118
129.1	33	58	36	457	146
129.2	33	58	36	438	140
129.3	33	58	36	401	128
130.1	36	58	32	454	145
130.2	36	58	32	501	160
130.3	33	57	11	482	154
130.4	33	57	11	423	135
131.1	35	58	9	482	154
131.2	35	58	9	401	128
133.1	35	58	3	432	138
133.2	36	58	34	444	142
133.3	35	58	10	463	148
134.1	31	57	1	181	58
134.2	32	57	34	282	90
134.3	32	57	35	560	179
134.4	32	57	35	501	160
135.1	34	58	12	482	154
135.2	34	58	12	313	100
135.3	34	58	1	250	80
135.4	35	58	2	482	154
135.5	35	58	2	429	137
135.6	35	58	10	376	120
137.1	33	58	30	482	154
138.1	34	58	12	501	160
138.2	34	58	13	482	154
138.3	34	58	13	626	200
143.1	32	58	20	482	154
143.2	32	56	20	463	148
143.3	32	56	20	482	154
144.1	32	56	25	235	75
145.1	34	58	32	269	86
145.2	34	58	31	316	101
145.3	34	58	31	432	138
146.1	33	57	1	463	148
146.2	34	57	36	432	138
147.1	33	58	29	376	120
148.1	36	58	34	532	170
148.2	35	58	3	482	154
148.3	35	58	3	463	148
150.1	32	56	28	457	146
150.2	32	56	29	507	162
151.1	32	58	15	482	154
151.2	32	58	15	482	154

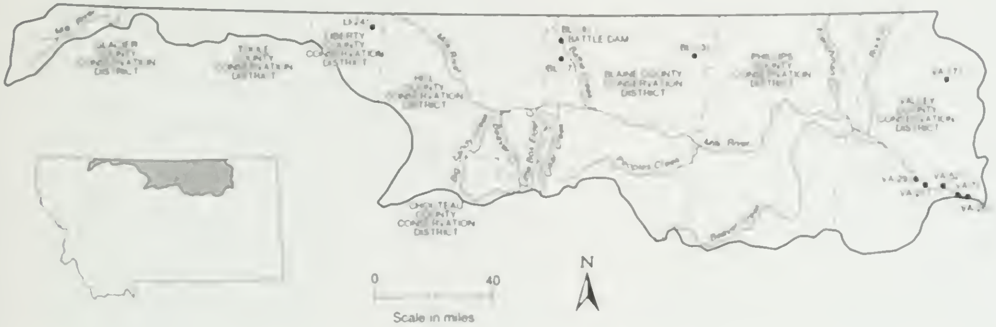
Project Number	--Point of Diversion-- TWN	RGE	SEC	Annual Diversion (af)	Project Acres
152.1	35	58	35	250	80
155.1	35	58	31	626	75
156.1	34	58	2	482	154
156.2	34	58	2	235	75
156.3	35	58	26	250	80
157.1	34	58	35	463	148
157.2	34	58	35	363	116
159.1	32	55	24	376	120
160.1	31	55	34	244	78
161.1	32	56	29	482	154
161.2	32	56	29	250	80
162.1	35	58	24	354	113
163.1	31	56	25	250	80
163.2	31	56	26	188	60
164.1	34	58	30	429	137
165.1	34	58	24	429	137
165.2	34	58	24	376	120
166.1	34	58	22	488	156
166.2	34	58	15	423	135
168.1	33	56	27	482	154
170.1	33	58	23	463	148
170.2	33	58	24	482	154
171.1	35	58	4	260	83
171.2	35	58	4	288	92
176.1	33	57	25	482	154
177.1	34	58	23	423	135
179.1	34	58	15	482	154
179.2	34	58	15	482	154
179.3	35	58	25	482	154
179.4	35	58	25	482	154
179.5	34	58	15	482	154
179.6	35	58	25	482	154
179.7	34	58	12	482	154
179.8	34	58	11	482	154
179.9	34	58	11	482	154
179.10	35	58	36	482	154
179.11	35	58	36	482	154
179.12	35	58	36	482	154
179.13	35	58	36	482	154
179.14	34	58	12	482	154
179.15	34	58	11	360	115
180.1	33	57	24	482	154
180.2	33	57	15	432	138

SOURCES:
Blaine County Conservation District 1991
Carter County Conservation District 1991
Daniels County Conservation District 1991
Liberty County Conservation District 1991
Little Beaver Conservation District 1991
McCone Conservation District 1991
Richland County Conservation District 1991
Roosevelt Conservation District 1991
Sheridan County Conservation District 1991
Valley County Conservation District 1991
Wibaux Conservation District 1991

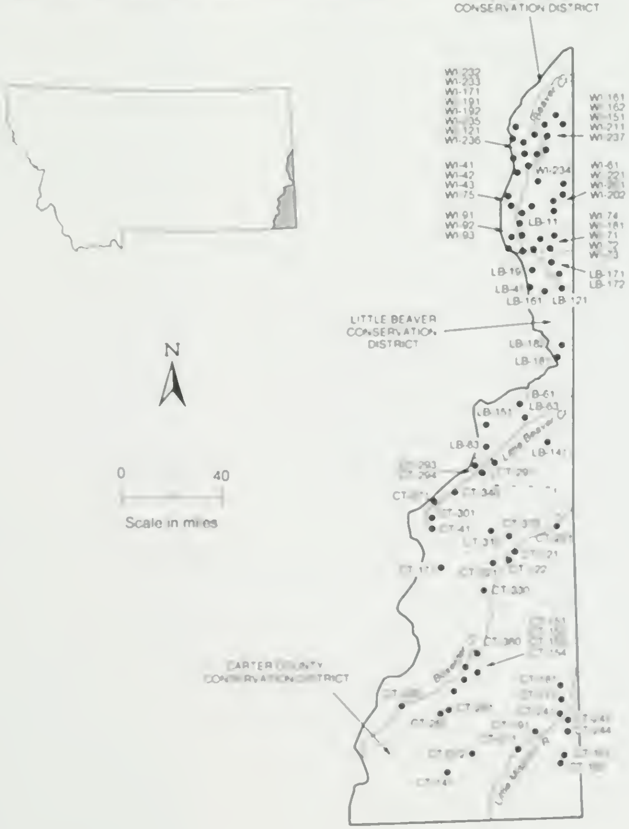
Map 1-2. Proposed Conservation District Projects in the Lower Missouri River Subbasin



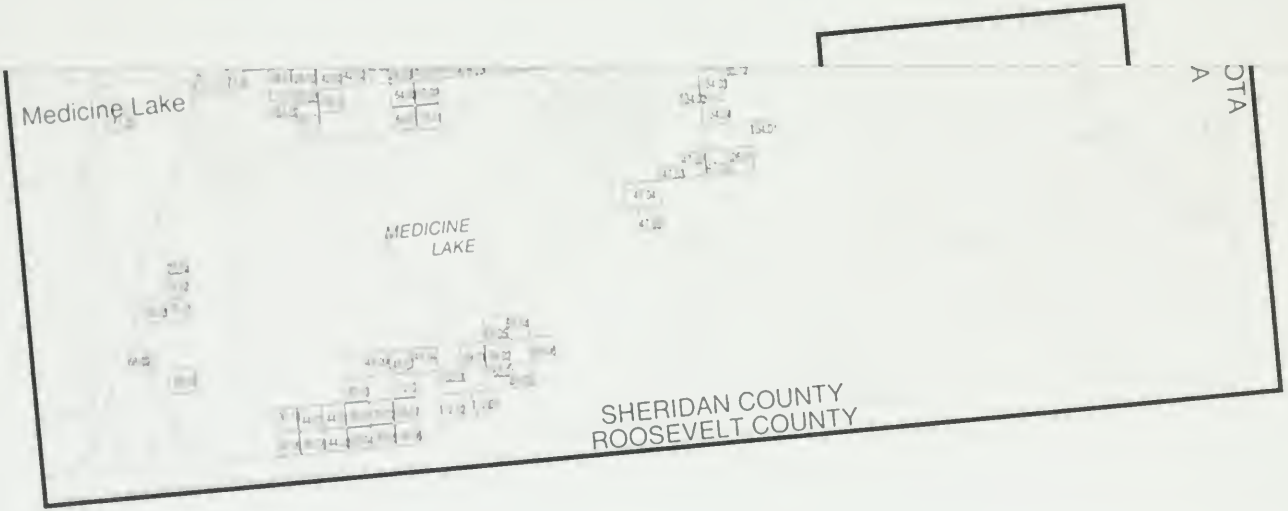
Map 1-3. Proposed Conservation District Projects in the Milk River Subbasin


GLACIER COUNTY CONSERVATION DISTRICT
TOOLE COUNTY CONSERVATION DISTRICT
LIBERTY COUNTY CONSERVATION DISTRICT
HILL COUNTY CONSERVATION DISTRICT
CHOUTEAU COUNTY CONSERVATION DISTRICT
BATTLE DAM
BLAINE COUNTY CONSERVATION DISTRICT
PHILLIPS COUNTY CONSERVATION DISTRICT
VALLEY COUNTY CONSERVATION DISTRICT
Milk River
Beaver Cr
0
40
Scale in miles
N

Map 1-4. Proposed Conservation District Projects in the Little Missouri river Subbasin


WIBAUX COUNTY CONSERVATION DISTRICT
Beaver Cr
LITTLE BEAVER CONSERVATION DISTRICT
Little Beaver Cr
CARTER COUNTY CONSERVATION DISTRICT
Little Missouri R
N
0
40
Scale in miles

Map 1-5. Groundwater Development Projects Proposed by the Sheridan County Conservation District



Map 1-5. Groundwater Development Projects Proposed by the Sheridan County Conservation District

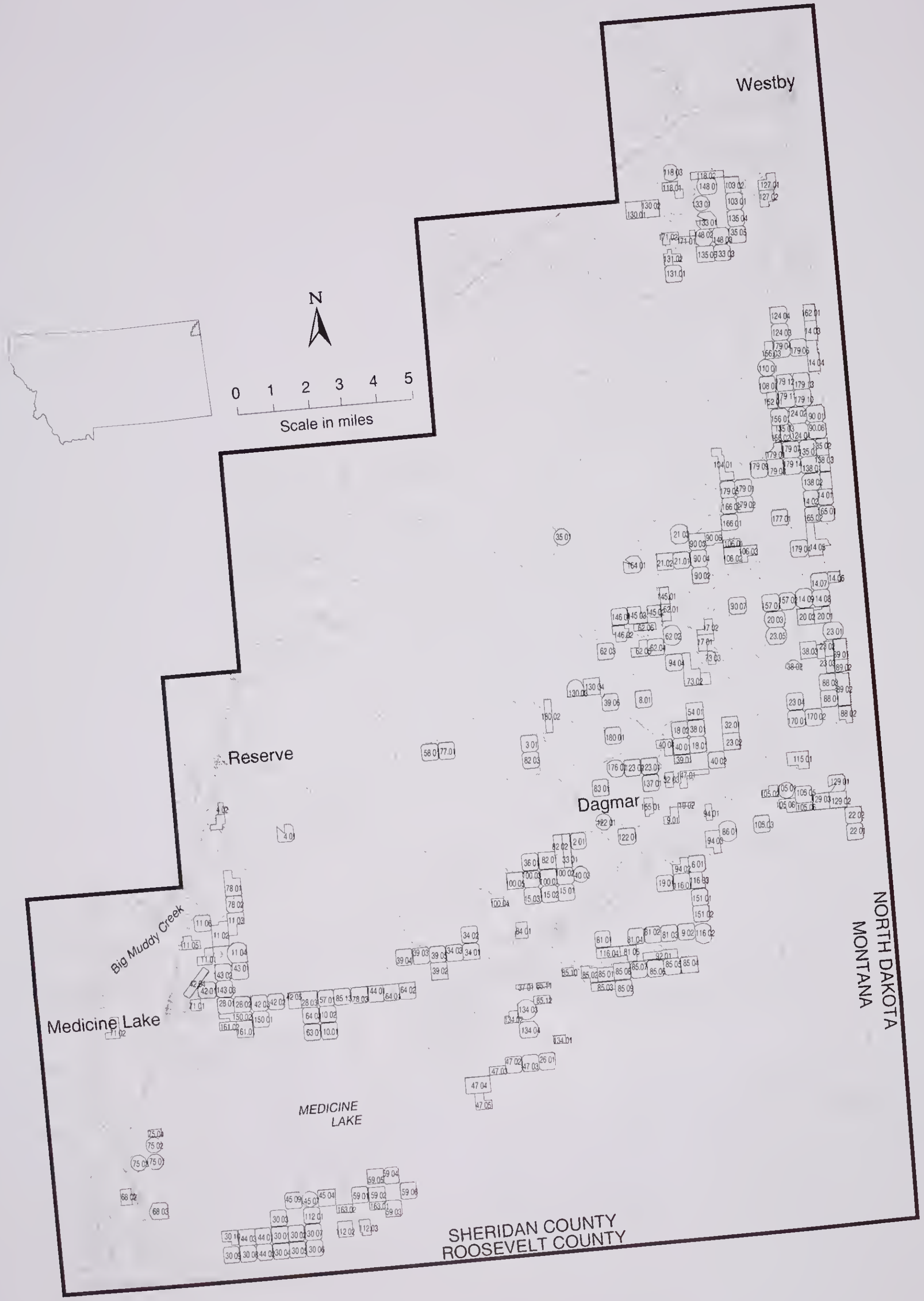


Table 1-2. Montana Department of Fish, Wildlife and Parks Instream Flow Requests

Stream	Reach	Dates Requested	—Amount Requested— (cfs)	(af)	(af/yr)
Milk River Subbasin					
Battle Creek	International boundary to mouth	Jan., Feb., Mar., Dec.	2.0	480	15,078
		Apr. through Nov.	5.0	2,420	
		Channel Maintenance Flows	1,970*	12,178	
Beaver Creek (Hill County)	Reservation boundary to Beaver Creek Reservoir	Year-round	7.0	5,068	5,068
Beaver Creek #1 (Phillips Co.)	Headwaters to reservation boundary	Year-round	0.2	145	145
Beaver Creek #2 (Phillips County)	Highway 191 to mouth	Jan., Feb., Mar., Dec.	7.0	1,679	15,950
		Apr. through Nov.	11.0	5,324	
		Channel Maintenance Flows	1,160*	8,947	
Clear Creek	Headwaters to Clear Creek Road	Year-round	5.0	3,620	3,620
Frenchman River	International boundary to mouth	Jan., Feb., Mar., Dec.	2.0	480	25,314
		Apr. through Nov.	5.0	2,420	
		Channel Maintenance Flows	2,050*	22,414	
Little Box Elder Creek	Headwaters to Clear Creek Road	Year-round	1.0	724	724
Peoples Creek	Headwaters to Barney Olson Road	Year-round	1.0	724	724
Rock Creek	International boundary to mouth	Jan., Feb., Mar., Dec.	2.0	480	27,600
		Apr. through Nov.	8.0	3,872	
		Channel Maintenance Flows	2,180*	23,248	
Lower Missouri River Subbasin					
Missouri River #7	Fort Peck Dam to Milk River	April 1-May 10	7,800	618,843	5,620,361
		May 11-June 30	11,000	1,112,727	
		July 1-Sept. 30	7,800	1,423,338	
		Oct. 1-Feb. 28	7,000	2,096,528	
		March 1-March 31	6,000	368,925	
Missouri River #8	Milk River to state line	May 11-June 30	11,500	1,163,305	5,522,972
		July 1-May 10	7,000	4,359,667	
East Fork Poplar River	International boundary to Middle Fork	Jan., Feb., Mar., Dec.	3.0	719	6,870
		April	15	893	
		May	10	615	
		June through Nov.	4	1,452	
		Channel Maintenance Flows	540*	3,191	
Middle Fork Poplar River	International boundary to East Fork	Jan., Feb., Mar., Dec.	1.0	239	10,685
		April	30.0	1,785	
		May	20.0	1,230	
		June through Nov.	2.0	726	
		Channel Maintenance Flows	1,000*	6,705	
Poplar River	Junction of Middle and East Forks to reservation boundary	Jan., Feb., Mar., Dec.	8.0	1,920	21,207
		April	70.0	4,165	
		May	50.0	3,074	
		June through Nov.	11.0	3,993	
		Channel Maintenance Flows	1,210*	8,055	
West Fork Poplar River	County bridge south of Peerless to reservation boundary	Jan., Feb., Mar., Dec.	3.0	719	13,121
		April	30.0	1,785	
		May	20.0	1,230	
		June through Nov.	4.0	1,452	
		Channel Maintenance Flows	1,190*	7,935	

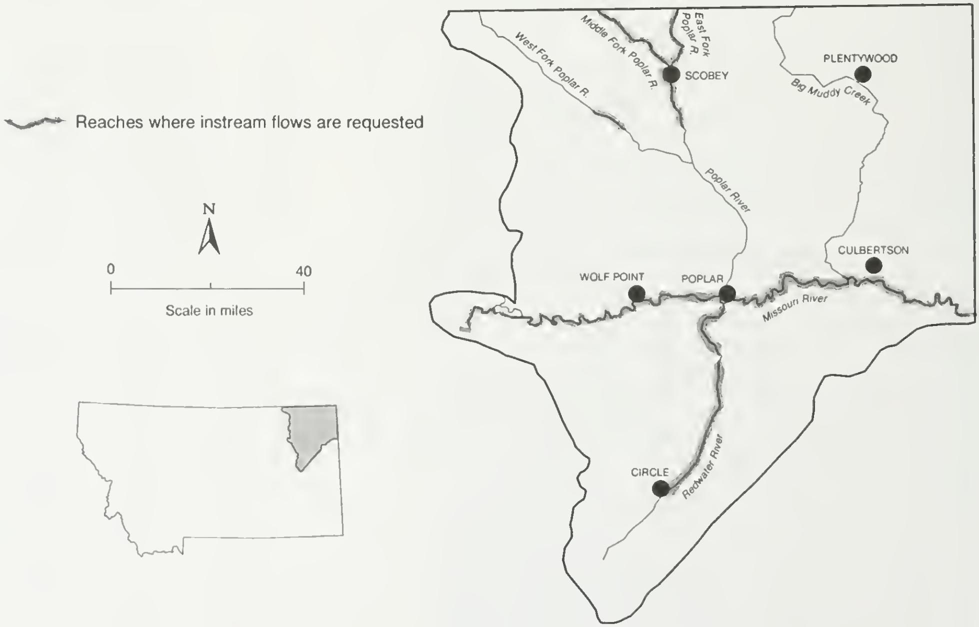
Table 1-2. Montana Department of Fish, Wildlife and Parks Instream Flow Requests

Stream	Reach	Dates Requested	—Amount Requested—		
			(cfs)	(af)	(af/yr)
Milk River Subbasin					
Battle Creek	International boundary to mouth	Jan., Feb., Mar., Dec.,	2.0	480	15,078
		Apr. through Nov	5.0	2,420	
		Channel Maintenance Flows	1,970*	12,178	
Beaver Creek (Hill County)	Reservation boundary to Beaver Creek Reservoir	Year-round	7.0	5,068	5,068
Beaver Creek #1 (Phillips Co.)	Headwaters to reservation boundary	Year-round	0.2	145	145
Beaver Creek #2 (Phillips County)	Highway 191 to mouth	Jan., Feb., Mar., Dec	7.0	1,679	15,950
		Apr. through Nov	11.0	5,324	
		Channel Maintenance Flows	1,160*	8,947	
Clear Creek	Headwaters to Clear Creek Road	Year-round	5.0	3,620	3,620
Frenchman River	International boundary to mouth	Jan., Feb., Mar., Dec.	2.0	480	25,314
		Apr. through Nov	5.0	2,420	
		Channel Maintenance Flows	2,050*	22,414	
Little Box Elder Creek	Headwaters to Clear Creek Road	Year-round	1.0	724	724
Peoples Creek	Headwaters to Barney Olson Road	Year-round	1.0	724	724
Rock Creek	International boundary to mouth	Jan., Feb., Mar., Dec.	2.0	480	27,600
		Apr. through Nov	8.0	3,872	
		Channel Maintenance Flows	2,180*	23,248	
Lower Missouri River Subbasin					
Missouri River #7	Fort Peck Dam to Milk River	April 1-May 10	7,800	618,843	5,620,361
		May 11-June 30	11,000	1,112,727	
		July 1-Sept. 30	7,800	1,423,338	
		Oct. 1-Feb. 28	7,000	2,096,528	
		March 1-March 31	6,000	368,925	
Missouri River #8	Milk River to state line	May 11-June 30	11,500	1,163,305	5,522,972
		July 1-May 10	7,000	4,359,667	
East Fork Poplar River	International boundary to Middle Fork	Jan., Feb., Mar., Dec.	3.0	719	6,870
		April	15	893	
		May	10	615	
		June through Nov	4	1,452	
		Channel Maintenance Flows	540*	3,191	
Middle Fork Poplar River	International boundary to East Fork	Jan., Feb., Mar., Dec	1.0	239	10,685
		April	30.0	1,785	
		May	20.0	1,230	
		June through Nov	2.0	726	
		Channel Maintenance Flows	1,000*	6,705	
Poplar River	Junction of Middle and East Forks to reservation boundary	Jan., Feb., Mar., Dec	8.0	1,920	21,207
		April	70.0	4,165	
		May	50.0	3,074	
		June through Nov	11.0	3,993	
		Channel Maintenance Flows	1,210*	8,055	
West Fork Poplar River	County bridge south of Peerless to reservation boundary	Jan., Feb., Mar., Dec	3.0	719	13,121
		April	30.0	1,785	
		May	20.0	1,230	
		June through Nov	4.0	1,452	
		Channel Maintenance Flows	1,190*	7,935	

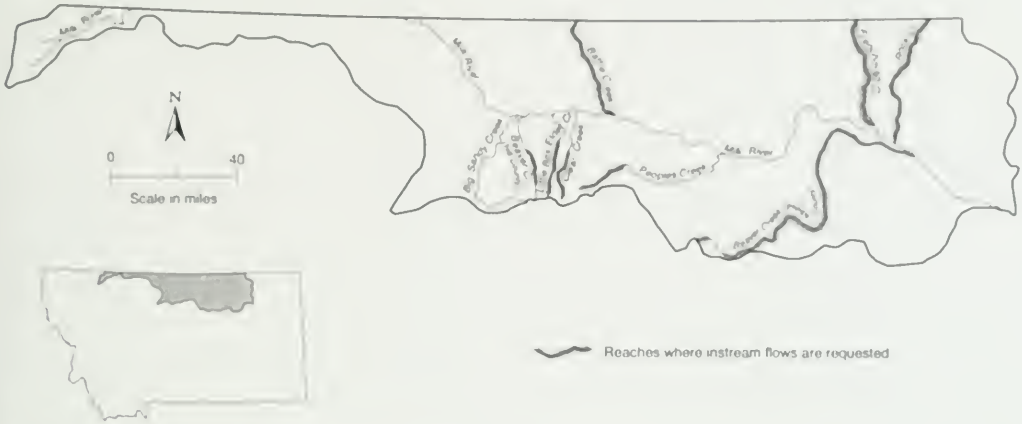
Stream	Reach	Dates Requested	—Amount Requested— (cfs)	(af)	(af/yr)
Lower Missouri River Subbasin (continued)					
Redwater River #1	Circle to East Redwater Creek	Jan., Feb., Mar., Dec.	2.0	480	12,792
		Apr. through Nov.	3.0	1,452	
		Channel Maintenance Flows	1,730*	10,860	
Redwater River #2	East Redwater Creek to mouth	Jan., Feb., Mar., Dec.	2.0	480	15,060
		Apr. through Nov.	4.0	1,936	
		Channel Maintenance Flows	2,010*	12,644	
Little Missouri River Subbasin					
Beaver Creek (Wibaux County)	Lamesteer Creek to state line	Jan., Feb., Mar., Dec.	1.0	239	7,984
		Apr. through Nov.	0.7	340	
		Channel Maintenance Flows	1,050*	7,405	
Boxelder Creek	One mile west of Belltower to state line	Jan., Feb., Mar., Dec.	4.0	960	20,682
		Apr. through Nov.	7.0	3,388	
		Channel Maintenance Flows	1,820*	16,334	
Little Beaver Creek	Russell Creek to state line	Year-round	3.0	2,171	17,895
		Channel Maintenance Flows	2,050*	15,724	
Little Missouri River	Montana-Wyoming border to Montana-South Dakota border	Jan., Feb., Mar., Dec.	5.0	1,199	32,562
		Apr. through Nov.	8.0	3,872	
		Channel Maintenance Flows	2,540*	27,491	

*Channel maintenance flow requests are for varying amounts over a 13- to 21-day period; only the peak daily request is included here.
af - acre-feet af/yr - acre-feet per year cfs - cubic feet per second
Source: Department of Fish, Wildlife and Parks 1991

Map 1-6. Location of Instream Flow Requests in the Lower Missouri River Subbasin



Map 1-7. Location of Instream Flow Requests in the Milk River Subbasin



Map 1-8. Location of Instream Flow Requests in the Little Missouri River Subbasin

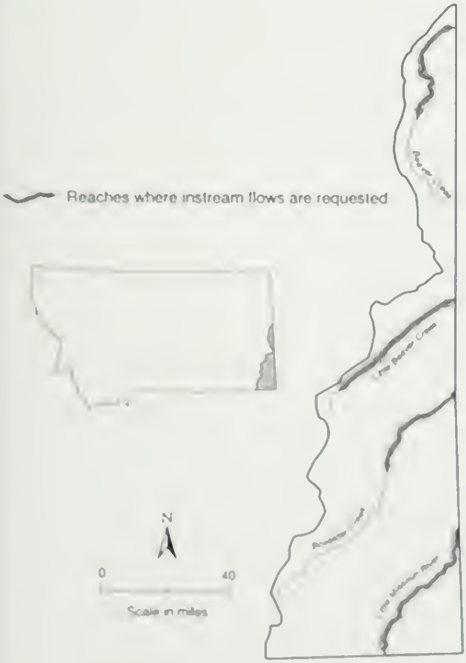


Table 1-3. Reservation Requests by Municipalities

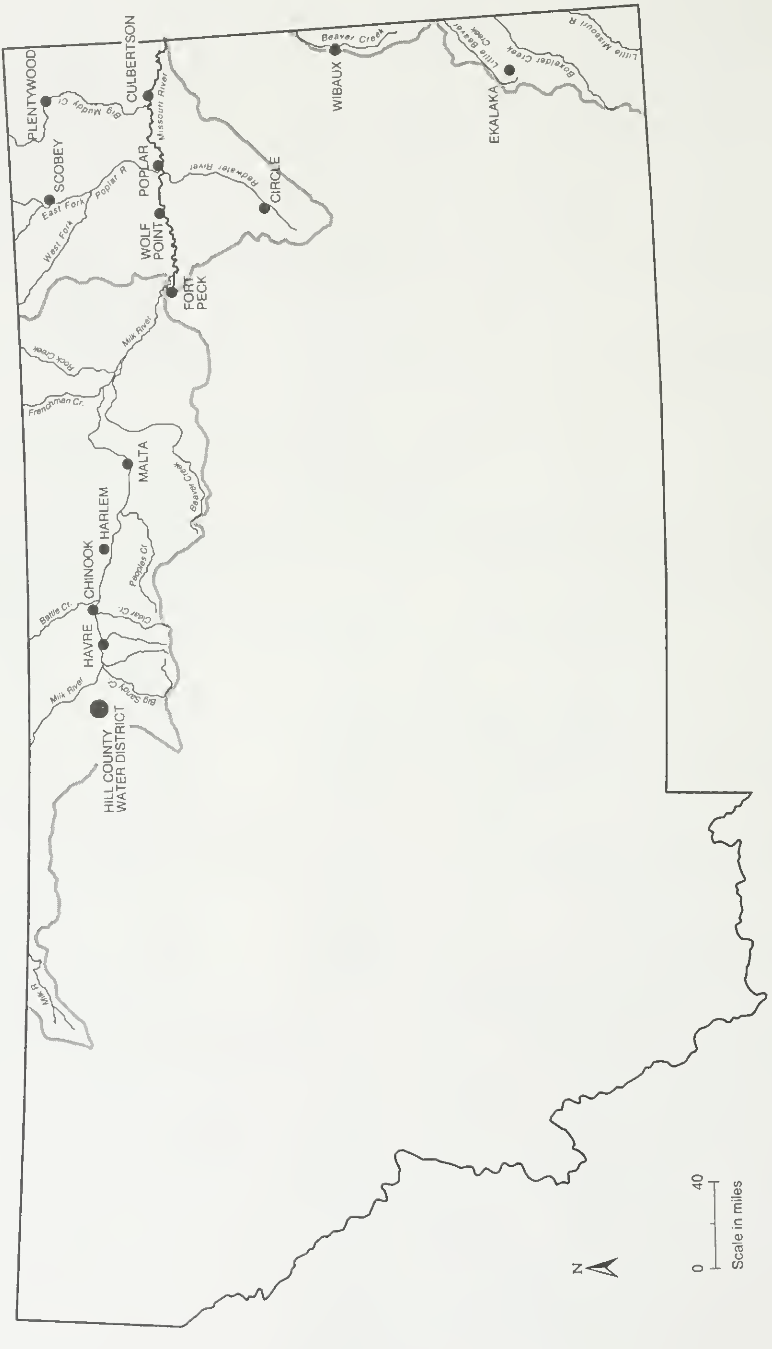
MUNICIPALITY	SOURCE	—AMOUNT— CFS	AF/Y
Chinook	(1) well	0.73	200
	(2) Milk River	[b]	600
Circle	well	0.57	78
Culbertson[a]	Missouri River	0.62	365
Ekalaka	wells	0.10	20
Fort Peck	Missouri River	0.30	100
Harlem	(1) well	0.73	200
	(2) Milk River	[b]	365
Havre	wells	2.2	475
Hill Co. Water District	Marias River	[b]	652
Malta	well	0.63	137
Plentywood	well	1.04	235
Poplar	wells	2.08	448
Scobey	well	1.04	168
Wibaux	wells	0.42	70.6
Wolf Point	wells	2.1	504

[a] Also includes water for proposed water and sewer district

[b] No peak flow rate request

Sources
Chinook 1991
Circle 1991
Culbertson 1991
Ekalaka 1991
Fort Peck 1991
Harlem 1991
Havre 1991
Hill County Water District 1991
Malta 1991
Plentywood 1991
Poplar 1991
Scobey 1991
Wibaux 1991
Wolf Point 1991

Map 1-9. Municipalities and Water Districts That Have Applied to Reserve Water in the Basin



AGENCIES WITH ADDITIONAL PERMITTING AUTHORITY

If the Board grants reservations, other agencies may have additional regulatory jurisdiction over project development. These agencies are listed in Table 1-4.

MONTANA WATER LAW

Water use in Montana is generally guided by the prior appropriation doctrine. One of the legal principles under the prior appropriation doctrine is "first in time is first in right." The first person to use water from a source establishes the first right, the second person is free to divert flows from what is left, and so on. During a dry year, the person with the earliest priority date has first chance at the available water to the limit of his or her established right. The holder of the second earliest priority date has the next chance, and so on.

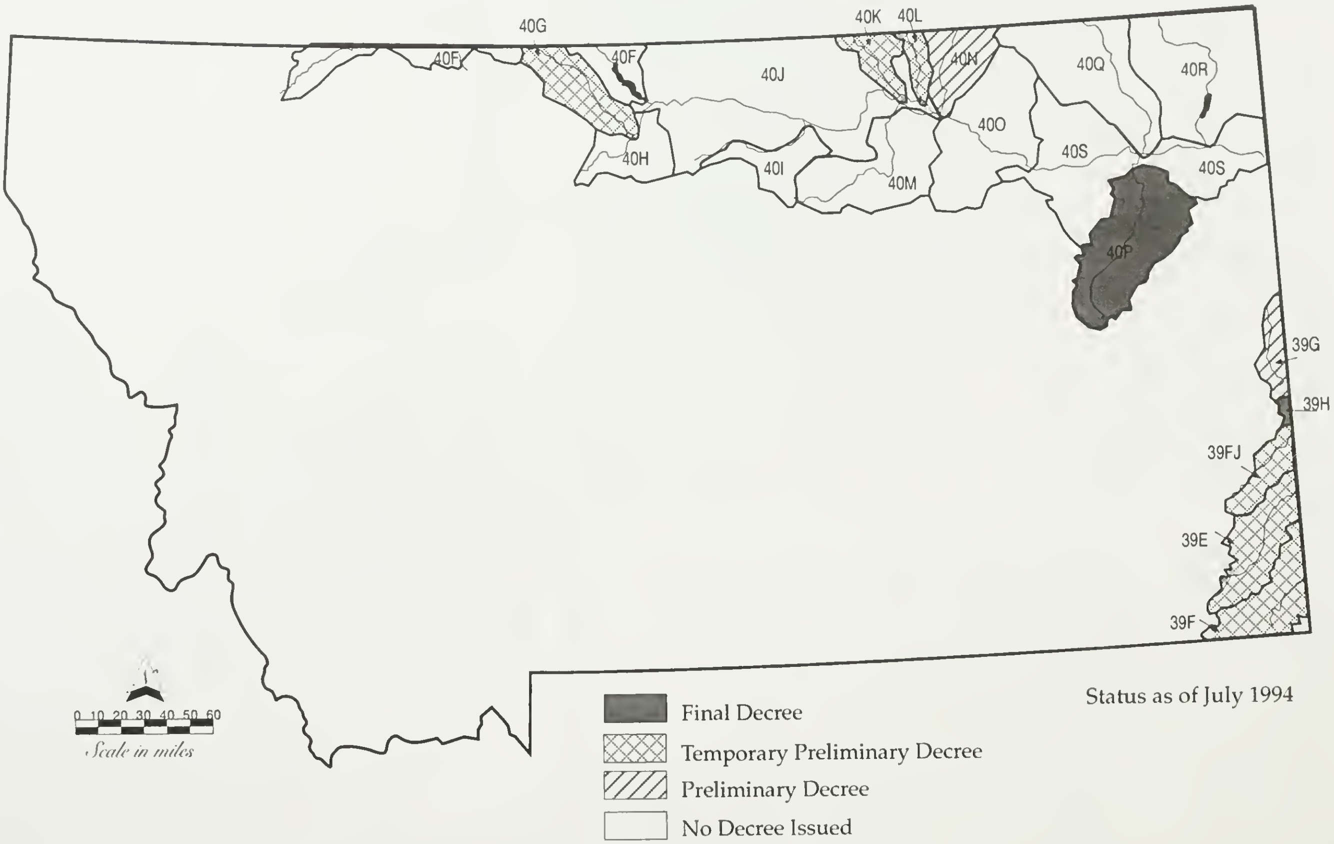
Another central element of the prior appropriation doctrine is that the water must be put to beneficial use. The Montana Supreme Court has stated that beneficial use is the "basis, measure, and limit" of a water right. McDonald v. State, 220 Mont. 519 (1986). Under Montana law, beneficial uses include, but are not limited to, agriculture (including stock water), domestic, fish and wildlife, industrial, irrigation, mining, municipal, power, and recreational uses. The nature and extent of a water right is defined by how water has been beneficially used in the past. Once a water right is established, it can be lost through abandonment if the beneficial use is not continued.

Under the prior appropriation doctrine in Montana, there are various "types" of water rights depending on what procedure for obtaining a water right was in force at the time the right was established. However, the basic principles of first in time, first in right, and beneficial use apply to all types of water rights acquired under state law.

The most significant change in how water rights are created and administered occurred in 1973 when the legislature enacted the Montana Water Use Act. The Water Use Act, effective July 1, 1973, recognized and confirmed water rights that had been used in the past. But, because there were only incomplete records to determine what water had been used, the act also created a system for filing claims and adjudicating those historical rights. This adjudication process also includes water rights claimed under federal law by Indian tribes and the federal government. Map 1-10 shows the status of the adjudication process in the basin above Fort Peck Dam. Further, the act established a new administrative permit system for obtaining a water right after July 1, 1973.

Table 1-4. Agencies with regulatory jurisdiction relating to water reservations

Agencies	Regulated activities
Conservation districts	Regulate private projects that affect the bed or banks of perennial streams
Counties	Regulate facilities within designated floodplains
Department of Fish, Wildlife and Parks	Regulates governmental projects that affect streams and consults with conservation districts regarding private projects
Department of Health and Environmental Sciences	Administers permitting process for water quality, air quality, and solid and hazardous wastes
Department of Natural Resources and Conservation	Issues water use permits and change of use permits, regulates dam safety
Department of State Lands	Regulates easements across state lands
State Historic Preservation Office	Administers Historic Preservation Act for projects affecting archaeological and historical resources
U S Army Corps of Engineers	Administers 404 water quality and wetland disturbance permits; regulates easements across public lands
U S Bureau of Land Management	Regulates special use permits and easements across public land
U S Fish and Wildlife Service	Administers Endangered Species Act



Map 1-10. Status of Water Rights Adjudication in the Lower Missouri River Basin

WATER RESERVATIONS

Montana has created a unique class of water rights labeled water reservations. Under the water reservation system, water is appropriated for existing instream or future water-consuming uses. Essentially, water reservations are similar to water right permits. However, there are important distinctions in who can hold this type of water right, the requirements for establishing the rights, the process for obtaining them, and in some cases, the possibility of having the rights reallocated to another use. Under the water reservation statute, only state or federal agencies or political subdivisions of the state may apply for a water reservation (§85-2-316(1), MCA). Water reservations may be acquired for any beneficial use.

The water reservation statute is the only means to acquire a water right for instream flows to protect water quality, fish, wildlife, and recreation. The purpose of instream flows is to maintain a minimum flow, level, or quality of water in a stream throughout the year, or for a length of time designated by the Board. These flows can be reserved without the usual requirement for withdrawal, impoundment, or diversion of the water and can be implemented immediately upon being granted.

The water reservation statute also allows water to be appropriated now for future consumptive use. By appropriating the water before it is needed, the reservant maintains an early priority date even though it may be years or decades into the future before the water is actually developed.

The Board of Natural Resources and Conservation is responsible for issuing orders adopting water reservations. Before an order reserving water may be adopted, the applicant must establish to the Board's satisfaction:

1. The purpose of the reservation
2. The need for the reservation
3. The amount of water necessary for the purpose of the reservation
4. That the reservation is in the public interest.

The Board's decision-making process regarding water reservations is covered by the Administrative Procedure Act (APA). Under the APA, appeal for judicial review by the district court is provided for any party who fully participates in the contested case hearing (typically not persons offering public testimony only) and who is aggrieved by the Board's final decision (§2-4-704(1), MCA).

However, the district court is limited in what it can review. The court will review only the record established by the Board and will not consider new evidence or testimony unless the appellant can show good reason why it wasn't presented to the Board. The court cannot substitute its judgement for the Board's, but can modify or reverse the Board's decision in the following situations:

1. The administrative findings, inferences, conclusions, or decisions are:
   (a) In violation of constitutional or statutory provisions;
   (b) In excess of the statutory authority of the agency;
   (c) Made upon unlawful procedure;
   (d) Affected by other error of law;
   (e) Clearly erroneous in view of the reliable, probative, and substantial evidence on the whole record;
   (f) Arbitrary or capricious or characterized by abuse of discretion or clearly unwarranted exercise of discretion; or
2. Findings of fact upon issues essential to the decision were not made, though they were requested (§2-4-704(2)(a,b), MCA).

The district court's decision can be appealed to the Montana Supreme Court.

A water reservation, when adopted by the Board, becomes a water right. However, if the objectives of the reservation are not being met, the Board can later modify or revoke that water right. The Board must review water reservations at least once every 10 years to ensure that the objectives of the reservation are being met. In the case of instream flows granted by the Board, all or a portion of the flow may be reallocated to a different use if the applicant for reallocation is a qualified reservant and can show that the instream flow is not required for its purpose and that the need for reallocation to the applicant outweighs the need shown by the original reservant. (§85-2-316(11), MCA.)

In June 1992, the Board acted on water reservation applications in the upper Missouri River basin above Fort Peck Dam. Reservations were granted for irrigation; municipal use; fish, wildlife and recreation, and water quality. Appendix B of the draft EIS contains a summary of reservations granted by the Board in the upper basin. In its final order, the Board placed stipulations on instream flow and irrigation reservations that limit the force and effect of these reservations in basins closed to the issuance of new water use permits. Then the 1993 Legislature passed bills closing the Madison, Jefferson, and Teton basins, and the Missouri River basin above Morony Dam near Great Falls to most new water use permits. These closures substantially limit the force and effect of the instream flow and irrigation reservations granted by the Board in those basins. The Board's order has been appealed. The appeals are pending before the district court.

Any water reservations granted in lower Missouri River and Milk River basins under the present reservation process will have a priority date of July 1, 1985. (§85-2-316, MCA.) In 1989, the legislature added the Little Missouri River basin to the Missouri River basin reservation process. The priority date for any water reservations granted in the Little Missouri River subbasin will be July 1, 1989. Although any reservations granted have the designated priority dates, the Board must further establish priorities among reservations granted with that priority date. One reservation may be established at 8 a.m., and the next at 8:05, and so on.

Persons who receive a water use permit on the Missouri River with a priority date between July 1, 1985, (or July 1, 1989, in the case of the Little Missouri River) and the date the Board adopts an order granting a water reservation may seek to have any or all reservations subordinated to the permit. However, for the Board to subordinate a reservation to a permit, the permit holder must show that the subordination will not interfere substantially with the purpose of the reservation.

ALTERNATIVES

To address the full range of options available to the Board and potential impacts, DNRC analyzed several alternatives in the draft EIS. They are: the Consumptive Use, Instream, Combination, and No Action alternatives. In Sheridan County, where extensive groundwater development is proposed, three different alternatives were analyzed: the Grant All, Partial Granting, and Coordinated Groundwater Development alternatives.

Municipalities were included under all but the No Action Alternative and given first priority because of the relatively small amount of water requested for their purposes and the high value of water for municipal use.

The Consumptive Use Alternative emphasizes the use of water for irrigation and municipal purposes. First priority in this alternative goes to municipalities, followed by proposed irrigation projects, and then instream uses. All irrigation projects proposed in the reservation applications were included in this alternative.

The Instream Alternative gives first priority to municipal uses, but emphasizes instream reservations for the protection of fish, wildlife, recreation, and water quality. Some irrigation reservation requests were included in this alternative, but with third priority.

To some extent, the Combination Alternative is similar to the Consumptive Use Alternative in that it gives first preference to municipalities, second to proposed irrigation projects, and third to instream uses. It differs primarily in that proposed irrigation projects are only included if they are at least marginally economically and financially feasible at least 50 percent of the time.

In Sheridan County, the City of Plentywood would have first priority under all but the No Action Alternative. The Grant All Alternative would allow the Sheridan County Conservation District to use all the water it requested in compliance with the district's reservation management plan. Under the Partial Granting Alternative, the Board would grant the Sheridan County Conservation District a reservation for the amount of water DNRC believes the Westby-Dagmar and associated aquifers can sustain (7,809 af/yr) without adverse effects to existing water right holders and wetlands. In the draft EIS DNRC identified the Coordinated Groundwater Development Alternative which would allow a larger reservation of 17,470 af/yr--the maximum amount that DNRC believes the aquifers might sustain. To help ensure that existing water right holders and wetlands would not be adversely affected, the Board would limit full use of the reservation until the area is declared a controlled groundwater area or the basin is closed. In the draft EIS only the controlled groundwater area. The Board would appoint an oversight committee including a hydrogeologist, a Sheridan County irrigator, and representatives of the conservation district, USFWS, the Sheridan County Planning Department, and an environmental group.

Under the No Action Alternative, DNRC described trends that might unfold through the year 2035 if no water is reserved for any purpose.

CHAPTER TWO

PROJECT UPDATE AND NEW INFORMATION

INTRODUCTION

This chapter provides information that was obtained or developed by the Department of Natural Resources and Conservation (DNRC) after preparation of the draft EIS. Additional information regarding the U.S. Army Corps of Engineers (CORPS) proposed changes to the Master Manual for Operations of Main-Stem Missouri River Reservoirs was obtained by DNRC and discussed below.

During the public review of the draft EIS, a number of comments were received on the Coordinated Groundwater Development Alternative for the Sheridan County Groundwater Area. DNRC provided notice and held an additional public meeting in Plentywood on June 2, 1994, to discuss more details of how this alternative might be implemented. A summary of this meeting is included in this chapter. Affected parties agreed to subsequent meetings.

In response to numerous comments, additional information is provided on the possibility of raising sugar beets with reserved water rather than alfalfa and small grains, as was assumed in the applications for reserved water from conservation districts along the lower Missouri River subbasin. Because this discussion is lengthy, it is included here rather than in Chapter Three of this document. Lastly, a brief update is provided on the status of several species under the Endangered Species Act.

MISSOURI RIVER MASTER WATER CONTROL MANUAL REVIEW AND UPDATE

This section provides an update on progress the Corps of Engineers has made in its review of the Missouri River Master Water Control Manual Review and Update (Review and Update). The draft EIS being prepared by the Corps is due to be published in 1994. However, the Corps has identified a preferred alternative that will be described in greater detail when its draft EIS is published (Appendix A). After the Corps' draft EIS is published, there will be a period for comment. Based on these comments, the Corps' draft EIS will be revised. The Corps will then issue a record of its decision. The outcome of the Corps' review process is not likely to be known before the Board makes its decision on water reservations.

RESULTS OF THE MEETING ON THE COORDINATED GROUNDWATER DEVELOPMENT ALTERNATIVE

During the public review of the draft EIS, DNRC received a considerable number of comments regarding the Coordinated Groundwater Development Alternative for the Sheridan County Groundwater Area. Most comments supported the alternative and requested further information regarding its general provisions. In response to the comments, DNRC held an informational meeting in Plentywood on June 2, 1994, to discuss the alternative in greater detail. Twenty-one people attended the meeting, which consisted of open forum discussions based on DNRC's presentation of (1) the Coordinated Groundwater Development Alternative and related water laws and legislation, and (2) possible approaches through which interested parties could present the alternative to the contested case hearing examiner for consideration. DNRC provided information and answered questions. The following text recounts the highlights of the meeting.

The Coordinated Groundwater Development Alternative contains several basic provisions. The alternative would provide the Sheridan County Conservation District (SCCD) with a reservation for approximately 17,479 acre-feet of groundwater withdrawals per year. As a possible condition on that reservation, the Board could appoint a Reservation Oversight Committee (Committee). This Committee was referred to in the draft EIS as the Controlled Groundwater Area Board of Supervisors and/or Board of Commissioners—the name has been changed to avoid confusion. This Committee would play a role in the administration of SCCD's water reservation either by (1) advising the

SCCD Board of Supervisors in approving or denying individual projects under the reservation, or (2) directly approving or denying the use of reserved water for individual projects based upon the following criteria.

1. There would be no substantial adverse impact to existing water right holders.
2. There would be no substantial adverse impact to wetlands.
3. The water proposed for development is suitable for irrigation and irrigating with it would not damage soil productivity.

The Committee also could specify monitoring or data collection needs or establish additional criteria on which to base permitting decisions. Satisfying these additional decision criteria could be the responsibility of the prospective irrigators or the Committee itself.

Decisions made by the Committee could be based on a consensus process, a simple majority vote, a 2/3 majority vote, or other voting scheme. Funding sources for Committee operations might include the Sheridan County Conservation District (SCCD), the Committee members themselves (and the organizations they represent), government or private sector grants, or other federal and state sources.

In line with SCCD's water reservation application, the Coordinated Groundwater Development Alternative also introduced the possibility of capping or limiting any future use of groundwater beyond that provided in the water reservation. In the draft EIS, this possibility was described via the designation of a Controlled Groundwater Area (Section 85-2-506, MCA). Further discussions after publication of the draft EIS revealed that a basin closure (Section 85-2-319, MCA) might achieve the same objectives. Table 2-1 compares and contrasts these two methods of capping groundwater withdrawals and summarizes DNRC's presentation of this material at the Plentywood meeting.

Following the presentation of the Coordinated Groundwater Development Alternative and related water laws and legislation, DNRC staff described the means through which interested parties could present the alternative for consideration by the contested case hearing examiner. Since the ultimate authority to grant, modify, or deny water reservations rests with the Board of Natural Resources and Conservation, proposed solutions would have to be presented to the Board via the

Table 2-1. Approaches for limiting groundwater withdrawals under the Coordinated Groundwater Development Alternative.

Controlled Groundwater area MCA 85-2-506	Basin Closure MCA 85-2-319
Would be initiated by petition tothe Board of 25 percent, or at least 20 of the groundwater users in thearea.	Would be initiated by petition of 25 percent, or at least 10 water users in the source of supply.
The Board designates by administrative order.	DNRC designates by administrative ruile
A person may not appropriate groundwater in a controlled groundwater area except by permit from DNRC. DNRC will grant no permits beyond capacity of aquifer.	After basin closure, DNRC will not accept applications for new permits. However, exceptions can be placed on closures for different types of appropriations and uses.
Order creating area also may close it to further appropriations; determine permissible withdrawals by day, month, or year; apportion permissible withdrawals in accordance with priority dates; accord preference to domestic and livestock purposes without regard to priorities; reduce permissible withdrawals for any appropriator; specify a rotation system for use of groundwater.	
Board can modify after reasonable process.	DNRC can modify after rulemaking process.
Can be created for a variety of water quality and quantity reasons, including preventing waste and interference with existing rights.	Can be created if unappropriated water is not available in the basin.

hearing examiner. Those interested in promoting a specific alternative, therefore, must submit a formal motion to be heard by the hearing examiner at the contested case hearing. After discussing this requirement, the parties attending the meeting decided to continue efforts to determine whether an agreement could be reached regarding an alternative that might resemble the Coordinated Groundwater Development Alternative. These efforts are still in progress.

SUGAR BEET PRODUCTION

INTRODUCTION

In the draft EIS, the proposed irrigation projects were analyzed using a 7-year alfalfa/1 year small grain crop rotation as proposed by the conservation districts in their applications. Alfalfa and small grain make up one of the more common and profitable crop rotations found throughout the lower Missouri River basin. All of the counties in the lower basin except Richland have over 80 percent of the their total irrigated acreage in either hay or small grain production.

Some specialty crops grown in the lower Missouri River basin may be more profitable than the alfalfa small grain rotation. Sugar beets are one of these crops. The profitability of sugar beets, however, is dependent on having a contract with the Holly Sugar processing plant in Sidney, and on having acreage that has a reliable source of water and that is within 90 miles of the processing plant.

Even though a crop rotation that includes sugar beet production may be more profitable than an alfalfa-small grain rotation, DNRC selected the alfalfa-small grain rotation to evaluate the proposed irrigation reservations in the draft EIS. The potential for increased sugar beet production in the lower Missouri River drainage was assumed to be relatively small. DNRC's position regarding sugar beet production reflected that of David Melin, Agricultural Manager for the Holly Sugar Corporation in Sidney, Montana, who said that the sugar beet industry probably will remain at its present level of production or possibly even shrink (Flaherty 1992).

DNRC received many comments on the draft EIS that sugar beet production was a realistic possibility in the Missouri River drainage. The comments indicated that a sugar beet rotation was more profitable than the alfalfa crop rotation which DNRC used in its analysis. Further, the commenters said that current sugar beet acreage along the Missouri River in North Dakota has been declining in productivity over the last several years due to rising groundwater caused by silting in the river channel, and therefore, Holly Sugar Corporation may consider contracting sugar beet acreage on the Missouri River upstream from Bainville. Given these comments, DNRC is including a supplemental analysis on sugar beet production. The following sections briefly discuss the methods used and the results of the analysis.

In this discussion, Richland County is used as an example because it encompasses portions of the Yellowstone River valley where sugar beets are currently grown and the Missouri River valley where more beets might be grown. Richland County, which has under 50 percent of its irrigated acreage in hay and small grain production, has approximately 35 to 40 percent of its irrigated acreage in sugar beet production.

METHODS

The methods used in the this supplemental sugar beet analysis are very similar to the methods discussed in Goroski (1993). Several of the assumptions are changed, however, based in part on discussions with David Melin, Agricultural Manager for Holly Sugar Corporation.

First, in its analysis, DNRC assumed a 1-year sugar beet/2-year small grain crop rotation. Holly Sugar prefers a 3-year rotation for disease control and requires it on acreage newly brought into beet production. Melin noted that although some of Holly Sugar's contracts dating back to 1925 allow producers to grow beets every year, Holly Sugar strongly recommends rotating sugar beets at least every other year and preferably every third year. Melin said that small grains, corn silage, and dry beans are used in the sugar beet rotation by some beet producers. DNRC used small grains in the rotation because the Montana Agricultural Statistics for 1991 show that dry beans and corn for both grain and silage make up only about 18 percent of the total irrigated acreage in Richland County, compared to about 26 percent in small grains.

DNRC assumed in its sugar beet analysis a representative farm size of 100 acres of sugar beets, 200 acres of irrigated small grain, 230 acres of dryland small grain, and 160 head of cattle. In discussions with DNRC staff, Melin said that the acreage of sugar beet contracts ranges from approximately 80 to 800 acres with an average size of approximately 135 acres. He recommended that contracts be for at least 100 acres.

Third, DNRC assumed that the water requested by the proposed irrigation projects could satisfy sugar beet water requirements with the proposed overhead irrigation systems. Melin indicated that along the Yellowstone River the dominant form of irrigating is with furrows and gated pipe, while overhead sprinklers dominate along the Missouri River. Holly Sugar prefers furrow irrigation because of optimal yields and ease of cultivation. Melin noted that overhead sprinkler systems cannot supply enough water for beets, especially during hot, dry, windy conditions, although these system have the advantage in applying herbicides.

Fourth, Melin said sugar beet production normally is feasible up to approximately 90 miles away from the processing plant. Given the water requirements of sugar beets and the 90-mile limitation, DNRC assumed that the proposed projects along the Missouri River main stem from Fort Peck to the Montana-North Dakota state line probably could raise sugar beets.

Fifth, after reviewing the Montana Agricultural Statistics, DNRC assumed a sugar beet yield of 20 tons per acre and an irrigated small grain yield of 55 bushels per acre. Melin noted that new sugar beet producers generally have a 5-year learning curve, commonly producing only 17 tons per acre on cropland that is capable of 22 tons per acre.

Sixth, based on its review of the Montana Agricultural Statistics, DNRC assumed a sugar beet price of $40 per ton. Melin indicated that the net selling price for sugar in 1991, 1992, and 1993 was approximately $22 per hundredweight. The net selling price of sugar is the return for sugar after deducting from the gross sales price all charges and expenditures that are customarily considered selling expenses. The sugar beet price is then derived depending on the adjusted average sugar content of the sugar beets. For example, if the adjusted average sugar content is 17.5 percent and the net selling price of sugar is $22 per hundredweight, then the sugar beet price is about $41 per ton. Melin noted that the sugar content for sugar beets along the Missouri River in North Dakota was approximately 16.7 percent in 1984, 18.9 percent in 1989, and 16.0 percent in 1991. The Montana Agricultural Statistics listed sugar content to be 17.2 percent in 1990 and 16.1 percent in 1991 for the Northeast District of Montana (Dawson, Richland, Roosevelt, and Sheridan counties).

RESULTS

The value of water for the proposed irrigation projects (consumptive value) assuming a sugar beet and small grain crop rotation are included in Table 2-2. Although the water values are higher using the sugar beet crop rotation, not all of these projects could grow sugar beets, and therefore, these values would overstate the actual value of the water. Melin said that as much as 2,500 to 3,000 acres might be contracted for sugar production on the Missouri River in Montana in the next 3 to 4 years, while the proposed projects in Table 2-2 total 44,567 acres. Beyond this 3- to 4-year time frame, projecting the acreage in sugar beet production becomes very difficult. Further, land already under irrigation may be in competition for these Holly Sugar contracts. If sugar beets are not grown on these proposed projects, then the value of water would be much less, such as the values in Table L-1 of the draft EIS.

ENDANGERED SPECIES ACT UPDATE

USFWS recently changed the status of bald eagle in Montana from endangered to threatened under the Endangered Species Act. This action reflects increases in bald eagle numbers.

A petition was recently submitted to USFWS by the Environmental Defense Fund, American Rivers, National Audubon Society, Nebraska Audubon Council, and the Mni Sose Intertribal Water Rights Coalition to list as endangered the sturgeon chub and sicklefin chub under the Endangered Species Act. The outcome of this process will not be known for at least six months (*Great Falls Tribune*, July 3, 1994).

Table 2-2. Comparison of water values for irrigation consumptive use (assuming sugar beet production) to instream use ($/acft)

	50 MILL (5 CENTS) PER KILOWATT HOUR REPLACEMENT COST			100 MILL (10 CENTS) PER KILOWATT HOUR REPLACEMENT COST		
SUBBASIN Drainage Project	CONSUMPTIVE VALUE 10/10	INSTREAM VALUE	CONSUMPTIVE VALUE MINUS INSTREAM VALUE 10/10	CONSUMPTIVE VALUE 10/10	INSTREAM VALUE	CONSUMPTIVE VALUE MINUS INSTREAM VALUE 10/10
LOWER MISSOURI						
Missouri River						
VA-01	64.72	29.68	35.04	64.72	55.64	9.07
VA-02	59.48	29.68	29.80	31.18	55.64	-24.47
VA-03	63.25	29.68	33.57	43.34	55.64	-12.30
VA-231	54.60	29.68	24.92	39.62	55.64	-16.02
MC-01	72.00	29.68	42.32	59.51	55.64	3.86
MC-03	70.97	29.68	41.29	58.81	55.64	3.17
MC-04	46.33	29.68	16.64	36.78	55.64	-18.86
MC-05	55.64	29.68	25.96	39.11	55.64	-16.53
MC-5A	47.64	29.68	17.96	36.41	55.64	-19.23
MC-06	65.04	29.68	35.36	53.65	55.64	-1.99
MC-6A	42.72	29.68	13.04	33.69	55.64	-21.95
MC-08	62.37	29.68	32.69	40.10	55.64	-15.54
MC-09	60.68	29.68	31.00	49.19	55.64	-6.45
MC-9A	35.32	29.68	5.64	35.32	55.64	-20.33
MC-10	51.00	29.68	21.32	32.76	55.64	-22.89
MC-11	68.63	29.68	38.95	51.93	55.64	-3.71
MC-12	48.14	29.68	18.46	27.38	55.64	-28.26
MC-99	72.07	29.68	42.39	50.22	55.64	-5.43
RI-01	76.84	29.68	47.16	59.47	55.64	3.83
RI-02	84.00	29.68	54.32	59.94	55.64	4.30
RI-03	87.35	29.68	57.67	59.02	55.64	3.38
RI-04	82.27	29.68	52.59	65.40	55.64	9.76
RI-05	82.43	29.68	52.75	66.56	55.64	10.91
RI-06	79.22	29.68	49.54	65.31	55.64	9.67
RI-07	63.39	29.68	33.71	32.78	55.64	-22.86
RI-08	80.38	29.68	50.70	54.81	55.64	-0.84
RI-09	78.41	29.68	48.73	53.00	55.64	-2.65
RI-10	83.97	29.68	54.28	57.18	55.64	1.54
RI-11A	70.31	29.68	40.63	57.48	55.64	1.83
RI-11	91.95	29.68	62.26	72.82	55.64	17.18
RI-12	72.30	29.68	42.62	57.06	55.64	1.41
RI-13	57.45	29.68	27.76	44.75	55.64	-10.89
RI-14	74.79	29.68	45.11	53.95	55.64	-1.70
RI-15	60.86	29.68	31.18	34.94	55.64	-20.70
CBI-1	97.67	29.68	67.99	69.26	55.64	13.62
CBI-2	70.86	29.68	41.17	51.55	55.64	-4.10
CBI-3	77.48	29.68	47.80	60.32	55.64	4.68
CBI-4	42.49	29.68	12.81	25.53	55.64	-30.11
CBI-5	53.82	29.68	24.14	38.46	55.64	-17.19
CBI-6	72.37	29.68	42.69	50.02	55.64	-5.62
CBI-7	24.62	29.68	-5.06	11.10	55.64	-44.54
CBI-8	94.86	29.68	65.18	65.52	55.64	9.88
CBI-9	77.35	29.68	47.67	44.82	55.64	-10.82
CBI-10	83.45	29.68	53.76	59.12	55.64	3.48
CBI-11	80.57	29.68	50.89	52.40	55.64	3.25
CBI-12	69.74	29.68	40.06	39.83	55.64	-15.82
CBI-13	63.17	29.68	33.49	27.14	55.64	-28.51
CBI-14	81.46	29.68	51.78	68.05	55.64	12.41
CBI-15	87.48	29.68	57.80	64.33	55.64	8.69
CBI-16	81.48	29.68	51.80	58.57	55.64	2.93
CBI-17	82.96	29.68	53.28	61.78	55.64	6.13
CBI-18	77.49	29.68	47.81	46.63	55.64	-9.01
CBI-19	81.81	29.68	52.13	67.69	55.64	12.05
CBI-20	67.01	29.68	37.33	67.01	55.64	11.37
CBI-21	76.85	29.68	47.16	56.96	55.64	1.32

CHAPTER THREE

COMMENTS, RESPONSES, AND CHANGES TO THE DRAFT EIS

This chapter presents DNRC's responses to public comments and questions on the draft EIS. Changes to the draft EIS also are included in this chapter.

Publication and distribution of the draft EIS on February 28, 1994, marked the beginning of a 45-day comment period. During this review stage, five public meetings were held to take comments on the draft EIS. Table 3-1 lists the locations and dates of these meetings and the number of people attending. Interested parties also were provided the opportunity to mail comments directly to DNRC. DNRC received 27 letters on or before the April 14, 1994, comment deadline, and five that were postmarked after the deadline. Responses were not prepared for the late comments, but the letters are reprinted at the end of this chapter.

Table 3-1. Meetings held to take comments on the draft EIS

Meeting location	Date	Number of people attending
Baker	March 21, 1994	13
Glasgow	March 22, 1994	34
Havre	March 22, 1994	10
Plentywood	March 23, 1994	25
Wolf Point	March 24, 1994	25
Total =		107

The following individuals attended the meetings:

Gordon Abar
Arthur Arnold
Chester Barnard
R.W. Black
Ken Bordett
Steve Brekke
Scott Brown
Joe Carleton
John Crohn
Monte Eayrs
Delores Engelhe
Neil Anderson
John Arnold
John Bergstrom
Jim Bolstad
Robert Boyce
John Brenden
Julie Burke
Duane Claypool
Charles Devaney
Charles Engelhe
Sever Enkerud
Marlene Erickson
Sawar Fay
Dale Fellon
Robert Fossum
Edgar Garwood
Richard Grabofsky
Jim Halverson
Wagner Harmon
Doug Hofeldt
Don Iversen
Roy Jones
Scott Kaiser
John Kemp Jr.
Arthur Kleinjan
Pete Kuhr
Hans Larsen
Bill Lee
Jim McColly
Richard Malcom
Milo Mattelin
Buckie McCoy
Jan Menger
Lester Nickels
Conrad Nystrom
Charles Oleson
Edward Olson
Eleanor Pratt
Steven Rosencranz
Warren Ross
David Schmidt
Doug Smith (Bainville)
Liter Spence
Jim Steinbeisser
Jack Stensland
Char Strommen
Gregory Thunem
Larry Tveit
Donnell Wangerin
Mike Wesen
Boone Whitmer
Cheryl Williss
Della Yeska
Jerry Zimmerman
Nick Faber
Teri Fellon
Clayton Foss
Dale Funk
Gerald Goroski
Tedd Gutzke
Dean Harmon
Mike Henry
Tim Holte
Llewell Johnson
Knud Kaae
Gordy Kampen
Carol Kienenberger
Miles Knudsen
Kurt Kurnmafeldt
Carla Lawrence
Neil Lunbull
Shelley Mackay
Wayne Mangold
Lee Matejovsky
Jerry Meissner
Linda Nelson
Melvin Novak
Ella Oleson
Larry Olson
Steve Pay
Thomas Putz
Scott Ross
Tom Ruffatto
Ed Smith
Doug Smith (Plentywood)
Wayne C. Stahl
Christy Stensland
Vern Steiner
Bill Tande
Bernice Tollefson
Kendall Vaughn
Luther Waterland
Tara Wesen
Arlys Williams
Bruce Wright
Gus Yeska

The following list includes the names of individuals or organizations that submitted written comments to DNRC on the draft EIS:

Peter Lesica, Ecological Consulting, Missoula
Steve Brekke, Reserve
Bernhard T. Hall, Director of Conservation, The Nature Conservancy of Montana
John E. Bloomquist, Dillon
Joe Webster, Regional Director, Mountain Prairie Region, United States Fish and Wildlife Service
Gerald Goroski, Wibaux
Milo Mattelin, Culbertson
Mark Shapley, Consulting Hydrogeologist, Helena
James E. Baldwin, Mayor, Culbertson
Senator Larry J. Tveit, Montana State Senate
Shirly Rasmussen, District Clerk, Roosevelt County Soil Conservation Districts
Liter Spence, Water Resources Supervisor, Fisheries Division, Department of Fish, Wildlife and Parks, Helena
Wayne C. Stahl, Phillips County Commissioner
Stan Wilmoth, Archeologist, State Historic Preservation Office, Montana Historical Society, Helena
Janet H. Ellis, Program Director, Montana Audubon Council
William O. Rathert, Wolf Point
John Overcast, Supervisor, Blaine County Conservation District
David C. Melin, Agricultural Manager, Holly Sugar Corporation
Allan Pipal, Wolf Point
Marylyn L. Weeks, President, Culbertson Implement Company
Boone A. Whitmer, Chairman, Lower Fort Peck Missouri River Development Group, Wolf Point
Doug Smith, Bainville
Tim J. Holte, Chairman, Sheridan County Conservation District
Board of County Commissioners, McCone County
Richard L. Long, Chief, Water and Lands Division, Great Plains Region, United States Bureau of Reclamation
George Budak, Poplar
James R. Halverson, Chairman, Board of County Commissioners, Roosevelt County
Larry Olson, Wolf Point

COMMENTS AND RESPONSES

The following pages present written and oral comments on the draft EIS and DNRC's responses to them. To avoid duplication, similar comments made by several parties were combined and answered only once. Comments also are categorized by topic to ease the task of locating a particular subject area. These categories are water quantity and distribution, legal concerns, water storage, water quality, stream channel form, vegetation, land use, fisheries, wildlife, historical/archaeological, recreation, socioeconomics, economics, Board decision criteria, and general. In many instances, the comments represented the opinion of the commenter, such as showing support or opposition to specific alternatives presented in the draft EIS and therefore did not require a written response by DNRC staff. Nevertheless, DNRC acknowledges these comments, which are listed separately in the OPINIONS section of this chapter. Changes and corrections to the draft EIS follow the comment and response section of this chapter.

WATER QUANTITY AND DISTRIBUTION

GENERAL

1. **Comment**: Where would Virgelle water diversion water go and who would benefit and pay for it?

Response: The Virgelle water diversion project proposed by the Bureau of Reclamation (BUREC) would pump water via a pipeline from the Missouri River near Virgelle to a canal where it would flow by gravity to a discharge point on the Milk River near Havre. Although a reservation for BUREC's proposed Virgelle Diversion project was granted in the upper Missouri River basin water reservation proceeding, it is not certain that the project will be developed. Before the project could be built, Congress would have to approve and fund it. If funded, the primary beneficiaries of the proposed diversion would be water users in the Milk River basin where existing supplies would be protected and future shortages would be reduced. Some new irrigation would be provided along the canal.

2. **Comment**: How long has DFWP collected actual streamflow measurements?

Response: Most stream gauging data are compiled by the U.S. Geological Survey and published each year (USGS 1993). Periods of record in the lower Missouri River basin vary from less than 1 year up to more than 80 years. Streamflow data for the Milk River at the eastern crossing of the international boundary, for instance, have been continuously recorded during warmer months since 1909. Many gauges are inactive during the winter, while some operate year round. Criteria DNRC used to identify "gauged streams" for DFWP water reservations are given in response to comment 4.

3. **Comment**: What is the Missouri River's flow in af/yr?

Response: Below Fort Peck Dam, the average annual flow of the Missouri River is estimated to be 6,527,000 af/yr while near the state line the flow is estimated to be 7,497,000 af/yr. Also see response to comment 4.

4. **Comment**: Page 94, Table 5-1 - The left hand table shows DFWP's instream flow requests for the Missouri River - Reach #7, and Missouri River - Reach #8, reduced to 1/2 the average annual flow (Aaf). For Reach #7, this is listed at 3,263,500 af. However, the USGS publication titled Water Resources Data, Water Year, 1992 lists the average annual flow for Reach #7 at 7,036,000 af (USGS gauge 06132000 below Fort Peck Dam) 1/2 is 3,518,000 af. This is for water years 1944-92, the period of record after operational level in Fort Peck Reservoir was reached.

For Redwater River - Reach #23, 1/2 of the average annual flow is listed at 14,200 af. However, this was derived for the gauge (06177825 near Vida) that was located at the extreme head of Reach #2, 400 ft downstream from the confluence of East Redwater River at river mile 30.6. This site is more reflective of flows in Reach #1, which ends at the East Redwater confluence, than in Reach #2.

Response: According to Montana Code Annotated 85-2-316(6), the Board cannot grant instream flow reservations for greater than "50 percent of the average annual flow of record on gauged streams." This statement was taken literally while assessing instream flow computations in order to avoid the subtleties and uncertainties of correcting for reservoir storage, irrigation development, interbasin diversions, and other depletions or accretions to natural stream flow.

A stream was considered by DNRC to be gauged if the following conditions were met:
a) The stream had at least 5 individual 12-month sequences of year round data with no missing readings;
b) The drainage area at the gauge site was within 20 percent of the drainage area at the bottom of the stream reach of interest.

Data were averaged by water year, unless another summation sequence would yield additional annual data.

In the case of the Missouri River (Reach #7) below Fort Peck Dam (USGS gauge #06132000), the summation sequence that yielded the maximum amount of data was a 59-year period of record from April 1934 through March 1992. The computed average annual flow was 6,527,000 af/year.

For the Missouri River (Reach #8), USGS gauge #06185500 was used. The period of record was 45 years, from October 1941 to September 1951, and April 1958 to March 1992. This period of record yielded an average annual flow of 7,497,000 af/year.

For the Redwater River, the drainage area above the base of Reach #2 was computed to be 2,099 square miles. The basin area above the USGS gauge #06177825 (Redwater River near Vida) is 1,974 square miles (USGS 1986), which is well within DNRC's criteria that identify a stream reach as being gauged.

5. **Comment**: How did DFWP determine flow rates on ungauged streams?

Response: The flow rates were computed by the U.S. Geological Survey (Parrett and Johnson 1994). On ungauged streams, estimates were based on considerations of drainage basin area and average precipitation, stream channel width, and concurrent measurements on a separate gauged stream.

Typically, if sufficient data were available to use all three methods, an averaging technique was used to estimate the flow for the ungauged site.

6. **Comment**: The EIS cites USGS as data source but USGS indicated data are not yet available and are based on only three sites. This seems like inconclusive data. More conclusive data are needed in the EIS.

Response: Daily streamflow data are published each year by the USGS for all of its active gauges in the annual "Water Resources Data" reports. For the lower Missouri River, this includes a gauge below Fort Peck Dam, one near Wolf Point, and one near Culbertson. This gauge density is very adequate for a regional hydrologic analysis, particularly if one considers that the average annual flow of the Missouri River increases by less than 7 percent between Fort Peck Dam and Culbertson (USGS 1992). Extended flow data used in the Missouri River Water Availability Model were provided by USGS, but have yet to be published.

7. **Comment**: It is not clear whether the DFWP instream flow requests were a factor in the calculation of the $39.00 per acre foot at the proposed Battle Creek Dam project (BL-181).

Response: DNRC used data from DFWP to determine flows that would be released from the reservoir. DNRC did not use DFWP's requested channel maintenance flow in the project design. Releasing a minimum flow outside of the irrigation season reduces the reliable water yield and increases the cost per acre-foot.

8. **Comment**: The draft EIS did not include either a narrative or the methodology used in estimating physical water availability for water-spreading projects. For example, page 9 stated that the physical availability and quality of the proposed water sources were used to screen irrigation projects, and page 20 stated:

> Stream gauge data were used to calculate available water for some projects, while flows were estimated in many ungauged watersheds (DNRC 1990). Groundwater availability was determined using available data and knowledge of local aquifer characteristics and, in the case of Sheridan County Conservation District, a report by the Montana Bureau of Mines and Geology (Donovan 1988).

The EIS, however, never goes into a discussion of how physical water availability is determined for water-spreading projects. Further, the conservation districts' applications and the DNRC 1990 publication also gives this subject only a hand waving. I (Gerald Goroski) would recommend that a narrative and the methodology used to estimate snowmelt runoff be included in the final EIS. I also would recommend that the final EIS clarify what the water availability amounts for the water-spreading projects represent in the conservation districts' applications (e.g. Wibaux C.D. Application, Table E-2). For example, do these amounts exclude existing water right amounts or are these amounts estimates of total runoff for a particular drainage above the water-spreading project?

Response: Physical water availability for water-spreading projects was determined using estimates of the amount of water that is available 8 years out of 10 (the 80 percent nonexceedance frequency) during snowmelt runoff (SCS 1990). The methodology relies on SCS maps that estimate the average annual runoff and the snowmelt fraction of that runoff for eastern Montana. SCS equations that factor these values to determine the 80 percent nonexceedance frequency were used.

Water-spreading projects were screened by assuming a minimum requirement of 1 foot of water per acre. If a project had too much acreage for the available water, then the project size was reduced as necessary. Recognizing that water-spreading projects may use more than the minimum amount of water when it is available, each project was designed for 1.5 feet of water per acre--the amount generally considered to be the maximum necessary for water spreading (DNRC 1976). Existing water rights were not considered in this analysis, but could be considered during the contested case hearing.

9. **Comment**: The document does not adequately address some of the assumptions used in the models. The location of the 6,000 acres irrigated from Battle Creek in Project BL-181 is not apparent to the reader. Is this land in the Battle Creek drainage or along the main stem of the Milk River below Saco, for example? This information should be included in the document.

Response: Many assumptions must be made during the development of any model. For a more detailed summary of the assumptions inherent within the Missouri River Model, please reference Dolan and DeLuca (1993). The model has been extended from Fort Peck Dam to the North Dakota border, but the principal assumptions remain the same. The principal assumptions inherent to the Milk River model are presented in Holnbeck and Sando (1989) and Sando and DeVore (1987). The model remains principally unchanged, except for some modifications to account for the water reservations. These reports are available from DNRC upon request.

The 6,000 acres associated with project BL-181 are existing irrigated land along Battle Creek and the main stem of the Milk River. BL-181 is intended to supply supplemental irrigation for this acreage.

10. **Comment**: The Army Corps of Engineers controls the flow of the lower Missouri River. A major problem is addressing the issue of coinciding peak water demands by irrigation and the proposed DFWP instream flow reservation. In years of below normal runoff, maintaining the water level of Fort Peck Lake to provide suitable recreational usage would result in lower than normal flows in the Missouri River below Fort Peck Dam. Thus, in successive years of low runoff, the goal of maintaining a decent recreational water level on Fort Peck Lake while providing 7,000 cfs to 11,500 cfs instream flow reservation and supplying irrigation water would be impossible to accomplish.

Response: Correct. Table J-1 illustrates streamflows in the lower Missouri River after subtracting DFWP's requested instream flows. Historic streamflow data (i.e. current operating guidelines) were used to compile streamflow statistics for Table J-1.

AVAILABILITY

11. **Comment**: Can the EIS break down the percentage of the streamflow requested by DFWP?

Response: See Table 3-2.

12. **Comment**: Please do not impinge upon the future of agriculture or business in the lower Missouri River basin by allowing DFWP to usurp what we doubt is any excess water now, let alone in the future.

Table 3-2. Comparison of DFWP requests to average annual flow

Stream	Source of flow data	Is the stream gauged?	Average annual flow (af/yr)	DFWP request (af/yr)	Does DFWP's request include channel maintenance flow?	DFWP request as % of average annual flow	Does DFWP's request exceed the 50% limit on gauged streams?	If DFWP's request exceeds the 50% limit, what is the maximum amount (af/yr) the Board could grant to DFWP?
Milk River Subbasin								
Battle Creek	DFWP 1991	No	23,200	15,078	Yes	65	NA[a]	
Beaver Creek								
Hill County	SCS 1994	Yes	13,100	5,068	No	39	No	
Beaver Creek #1								
Phillips County		No	Unk	145	No	Unk	No	
Beaver Creek #2								
Phillips County	USGS 1993	Yes	38,300	15,950	Yes	42	No	
Clear Creek	DFWP 1991	No	6,520	3,620	No	56	NA	
Frenchmen Creek	DFWP 1991	No	49,300	25,314	Yes	51	NA	
Little Box Elder Creek	DFWP 1991	No	3,620	724	No	20	NA	
Peoples Creek	DFWP 1991	No	3,620	724	Yes	20	NA	
Rock Creek	DFWP 1991	No	67,400	27,600	Yes	41	NA	
Lower Missouri Subbasin								
Missouri River #7	USGS 1993	Yes	6,527,000	5,620,361	No	86	Yes	3,263,500
Missouri River #8	USGS 1993	Yes	7,497,000	5,522,972	No	74	Yes	3,748,500
East Fork Poplar River	USGS 1993	Yes	19,300	6,870	Yes	36	No	
Middle Fork Poplar River	DFWP 1991	No	22,500	10,685	Yes	47	NA	
Poplar River	DFWP 1991	No	42,700	21,207	Yes	50	NA	
West Fork Poplar River	DFWP 1991	No	13,800	13,121	Yes	95	NA	
Redwater River #1	USGS 1993	Yes	28,400	12,764	Yes	45	No	
Redwater River #2	USGS 1993	Yes	28,400	15,032	Yes	53	Yes	14,200
Little Missouri Subbasin								
Beaver Creek (Wibaux County)	USGS 1993	Yes	24,100	7,984	Yes	33	No	
Boxelder Creek	USGS 1993	Yes	65,600	20,682	Yes	32	No	
Little Beaver Creek	USGS 1993	Yes	32,200	17,895	Yes	56	Yes	16,100
Little Missouri River	USGS 1993	Yes	93,600	32,562	Yes	35	No	

[a] NA means not applicable

Response: The water reservation proceeding involves numerous competing interests with respect to the use of Montana's water resources. The Board of Natural Resources and Conservation will have to afford all of these interests equal consideration when making its final decision in the matter.

13. **Comment**: Does DFWP think that water is available (for water reservations)?

Response: DFWP applied for an amount of water the agency considered necessary to support aquatic life and the other related purposes for its reservation requests. Although the reservation statutes do not require that water always be available for the Board of Natural Resources and Conservation to grant a reservation, DFWP (like all applicants) was required to submit an analysis of the physical availability of flows for their water reservation requests (ARM 36.16.105B). The Board will have to decide whether the flows requested by DFWP are appropriate.

14. **Comment**: What would FWP do with granted water reservations?

Response: See page 20 of the draft EIS for a discussion of the purpose of DFWP's reservation requests. Generally, after senior water rights are satisfied, water for instream flows would remain in the stream channel to benefit fish and wildlife habitat and recreation.

15. **Comment**: DFWP's instream flow requests in the Little Missouri River subbasin for the month of April are in direct competition with irrigation interests. Would DFWP be willing to drop their requests for the month of April?

Response: Inquiries into DFWP's willingness to alter its reservation requests could be asked at the contested case hearing.

16. **Comment**: Page 21 and Appendix J - Regarding DFWP requests and amounts, Appendix J shows no water. How can they (DFWP) ask for 50 percent of nothing? There are no months where 50 percent is left in the stream.

Response: Revised Appendix J (see Changes to the Draft EIS) shows the amount of water that would be left for other users after DFWP reservations (if granted) are satisfied. As with any reservation granted by the Board, there may not be sufficient water available to satisfy the reservations during low flow periods. Simply granting a reservation does not guarantee that water will be available at all times. See response to comment 11 for related information.

17. **Comment**: How can you reserve water that isn't there--it's already been allocated?

Response: The water reservation statutes do not require that water always be available in order for the Board to grant a reservation. The applicants, however, are required to submit an analysis of the physical availability of flows for their water reservation requests (ARM 36.16.105B). Data on the physical availability of flows for the reservation requests also were provided in Appendix D of the draft EIS. Reservations, if granted, are water rights, and like other water rights are based on the prior appropriation doctrine. The reservants--like other water right holders--can use water only when it is legally available.

18. **Comment**: DFWP asks for more than 50 percent of average flows - Appendix D Table D-1, average flows at node 36 Missouri River May-June average 8,266 cfs, June-April 9,728 cfs. DFWP has requested, from page 21, Table 3-2 May 11-June 30, 11,500 cfs, and July-May 10, 7,000 cfs. As you can see the amount requested for May-June is more than the average flow, and the 7,000 cfs requested for the rest of the year is 72 percent of the average flow.

Response: DNRC recognized that these specific reservation requests by DFWP exceeded the statutory limit for instream flow reservations on gauged streams (50 percent of the average annual flow of record). Like all other instream flow reservations that exceeded this limit, DNRC reduced these DFWP requests. See Table 3-2 of the final EIS for a listing of proposed DFWP instream flow requests that were reduced in this manner. Also note that the 50 percent limitation applies only to gauged streams, and that the mean annual flow value that is used to determine the 50 percent limitation is derived from gauge data.

19. **Comment**: Page J-3, Table J-1 - An explanation of how these numbers were derived would be helpful. They appear to be derived from Table D-1 and the DFWP instream flow request in Table 3-2.

Response: Revisions to Appendix J (see Changes to the Draft EIS) show the flow that would remain if the Board grants the instream reservations. Where DFWP's requests exceed the 50 percent limit on gauged streams, the instream reservations were reduced (see Table 3-2). The numbers, except those in parenthesis, were calculated by subtracting DFWP's requested or reduced instream flows from USGS or DNRC estimated monthly flows for those streams shown in Appendix D of the draft EIS.

The numbers in parenthesis are estimates of flows remaining after DFWP's requested channel maintenance flows are subtracted. To calculate these numbers, monthly flows for a stream for the period during which DFWP requested channel maintenance flows were converted to acre-feet. DFWP's channel maintenance flow request also was converted to acre-feet and totaled. The DFWP total flow was then subtracted from the flows for the months where requested, beginning with the first month, until no flows were left. For instance, assuming that DFWP's requested 100 af of channel maintenance flow for a stream during the period March through May, and that total flows for that stream average 25 af in March, 50 af in April, and 100 af in May, then the estimated amount of water remaining for that stream after channel maintenance flows are subtracted would be 0 af in March, 0 af in April, and 75 af in May. Finally, the value for May would be converted to 1.3 cfs (1 cfs = about 59.5 af/month) and placed in parenthesis in the table.

RETURN FLOWS

20. **Comment**: DFWP reservations should not be granted on tributaries to the Milk River because irrigators already maintain instream flows through return flows.

Response: Although return flows from irrigation may augment streamflows after the irrigation season, more water is taken out than is returned during the irrigation season. See the return flow discussions on pages 27-29 and 101-107 of the draft EIS.

21. **Comment**: The statement on page S-2, in the last paragraph, that impacts to stream flows would be greatest under the consumptive use alternative needs to be more fully explained in terms of a consideration of return flows and the beneficial aspects under the Consumptive Use Alternative for late summer, fall, and winter flows.

Response: Streamflow augmentation due to return flows tends to decrease rapidly following irrigation. The rate of reduction is a function of the groundwater hydrology in the basin, but as a rule the quantity of water that returns to the stream in early winter (within several months after irrigation) is fairly small. Most groundwater return flows will occur in the first month or two following irrigation. Return flow contributions are discussed in more detail on pages 27 and 101 of the draft EIS. Return flow contributions to fall and early winter streamflows may be seen in Figures 6-1 through 6-12 and in Tables D-1 and D-2 of the draft EIS.

22. **Comment**: Page 153, third paragraph. Spring diversions to water-spreading systems are a form of storage and should help flows in late July and August.

Response: Return flows from all types of irrigation constitute a form of storage. The underground "reservoir" will often augment flows for several months after irrigation. Portions of this water, however, are lost to evaporation or consumed by plants.

GROUNDWATER

23. **Comment**: From Table 7-1 (p. 194 of the draft EIS), it isn't clear whether the municipal water listed comes only from the Missouri River. Well water shouldn't be included in this figure.

Response: In the draft EIS, municipal water supplies in the lower Missouri River basin were examined in the hydrologic water availability model developed by DNRC. The model's consideration of municipal supplies did not distinguish between surface and groundwater sources because groundwater depletions ultimately will affect surface water supplies. When considering municipal water reservation requests, however, DNRC did distinguish between surface and groundwater sources. See page 24 of the draft EIS, Table 3-3, and the discussion under Groundwater projects outside the Sheridan County Groundwater Area, pages 121-122 of the draft EIS, for information regarding municipal water reservation requests. Lower Missouri River basin municipalities have applied to reserve 4,618 acre-feet of water. Of this amount, 465 acre-feet, or about 10 percent, would be diverted from the Missouri River by Culbertson and Fort Peck.

24. **Comment**: What about subsurface flows (particularly from Fort Peck Reservoir), including effects on underground water? Water quality is a way to identify such flows.

Response: Based on the regional geology of the area, it is unlikely that subsurface flows from Fort Peck Reservoir have any bearing on groundwater conditions where reservations are requested.

25. **Comment**: Pumping from deep aquifers may recharge shallow (surface linked) water tables. Need more study of these linkages. In the Sheridan County Groundwater Area from Medicine Lake to east of Dagmar, shallow water tables are NOT linked to deep water wells used for irrigation. We need to distinguish between surface connected groundwater and deep water (groundwater) that is NOT linked to surface (lake levels).

Response: The observations that you discussed are informative and may have direct bearing on your appropriation and on future water allocations in the area. However, even though there may be no local or immediately obvious connection at the wellhead or in the vicinity of the irrigation project, these deep aquifers may be linked to shallow aquifers and to lakes in distant areas. If this is the case, then withdrawals from the deep aquifers could cause impacts that are spread over a large area, remote from the area of withdrawal, and generally difficult to detect or to attribute to a particular well. The discussion on pages 117-119 of the draft EIS attempts to explain these large- scale impacts. Additional study would be needed to determine site-specific effects.

26. **Comment**: USFWS agrees that more information about the aquifer in the Sheridan County Groundwater Area is needed. We would like to see more intensive modeling and well testing. The aquifer may be fully appropriated. We need to know wetlands effects resulting from irrigation project development, especially north of Medicine Lake. USFWS wants to work cooperatively with the Sheridan County Conservation District and local groups to determine sustainable aquifer yield. We all need additional detailed site-specific aquifer studies.

Response: DNRC recognizes the desire of USFWS to have more information concerning aquifer linkages and flow behavior, and encourages the USFWS's efforts to conduct further studies in the area, regardless of the Board's final decision. Such studies could be required by the Board as a condition to the Sheridan County Conservation District water reservation, if granted.

27. **Comment**: Under Existing Wells - In addition to drilling new wells, you should make some mention of capping/sealing old wells (water quality issue).

Response: The abandonment (capping/sealing) of unused water wells and water wells that are in disrepair, improperly constructed, or unusable is required by law (Board of Water Well Contractors, ARM 36.21.669A). Enforcing this regulation is outside the scope of the draft EIS, but is currently being considered by the State Groundwater Planning Committee. For more information, contact the DNRC Water Management Bureau at 444-6637.

28. **Comment**: Page 117 - Discussion of safe yield is presented here. The conservation districts point out that water must be "mined" in dry years to allow storage in wetter years. The only way to determine safe yield is to stress the aquifer and observe the results and make adjustments accordingly. Furthermore, the groundwater tests should analyze physical and legal availability of water as the basis of decisions on groundwater appropriation.

Response: In the context of groundwater withdrawals, the word "mining" is reserved to describe withdrawals that will completely deplete an aquifer. If groundwater withdrawals are such that the aquifer is capable of recharging during wetter years, then the withdrawals would not be considered "mined" water.

The idea of stressing the aquifer, observing the results, and making adjustments accordingly is the basic premise of the Coordinated Groundwater Development Alternative. This alternative would provide a means of creating a management team that could work toward optimal use of the aquifer system (draft EIS, p. 121). To the extent that "stressing" an aquifer and then making adjustments entails investment in irrigation equipment, it can be fairly disastrous for the farmer that can't recoup his investment.

Further study is needed to determine a precise volume of groundwater that is "physically and legally available" from a complicated aquifer system that is suspected to interact extensively with surface waters, some of which may sustain federally protected wetlands.

29. **Comment**: Page 120. Has the Donovan model been calibrated to historic stress? Discussion of calibration of the model should be included in the analysis at this stage.

Response: No, the Donovan model does not include consideration of drought years or past groundwater withdrawals. The analyses conducted with this model produced the only available information regarding large-scale impacts of multiple high yield withdrawals from what is believed to be the discharge end of the aquifer. As stated in the draft EIS, page 120, the model provides some insight as to how pumping could affect water levels at Medicine Lake. The results of the model analysis are presented because they are available and informative, but they are not considered comprehensive.

30. **Comment**: Donovan's study, which is referenced throughout the draft EIS, resulted in a model that is regional in scope, and may not address site specific impacts. One mile square grid cells appear to be an adequate baseline for continued study of aquifer characteristics, but cannot predict small-scale fluctuations in water levels in refuge impoundments and waterfowl production areas. As little as 1 or 2 feet of drawdown may affect aquatic vegetation and nesting habitat of endangered piping plover and other species. USFWS is concerned that additional development may have an adverse effect on existing senior water rights and property rights held by the United States, and on the private wetlands overlaying the aquifer. In order to protect the biological values of the Medicine Lake wetland complex, a program of updating and further refining of Donovan's model, adding data from 1988 to 1993, is necessary. This program should be combined with ongoing water level monitoring and pump testing for individual district projects within the framework of staged development as proposed by DNRC in the Coordinated Groundwater Development Alternative. Any reservation of water beyond sustainable yield will be vigorously opposed by USFWS.

Response: The draft EIS does not suggest that the Donovan (1988) study is capable of addressing site-specific impacts. The suggested procedure of establishing an appropriate water level monitoring scheme and acquiring pump test data for individual district projects is included in the description of the Coordinated Groundwater Development Alternative (p. 99, col. 2, para. 2) in the draft EIS. Donovan (1993) suggests that there probably is some justification in revising the model with the longer period of water level records that is now available, and suggested a number of improvements that could be made based on the current state of knowledge of the aquifer. On the other hand, an adequate monitoring program, including regional lake level and lake chemistry monitoring, and detailed testing on individual projects, may provide enough information to base decisions without the costly work of trying to refine Donovan's groundwater model, which would still be regional in scope and provide general insights rather than precise solutions.

31. **Comment**: USFWS would like a copy of Donovan's model for use by USFWS hydrologists. The model should be updated and run with data from 1988 to the present, a period which includes a wet year.

Response: The model is not available from the Montana Bureau of Mines and Geology, where it was generated. The Sheridan County Conservation District was unable to provide DNRC with a copy when requested. In discussions with DNRC staff, Donovan indicated that he cannot locate his original input files for the model. The model does not operate with a historic database that can simply be updated and run. The model would need to be completely revised on the basis of new information (see response to comment 30).

32. **Comment**: Page 86 of the draft EIS says: "Land subsidence is a possible consequence of excessive withdrawals of groundwater from aquifers, especially if they are confined. The resulting impacts would be irreversible."

This is untrue. I (Boone A. Whitmer) am a past licensed water well contractor in the State of Montana and have in excess of 30 years of experience drilling water wells in eastern Montana. I know of no subsidence of any land due to withdrawal of groundwater. The groundwater is found in only two types of geologic formations in eastern Montana, and they are sandstone and glacial till. Neither formation will subside when depleted of groundwater.

Response. The draft EIS does not state that any land subsidence has occurred in Montana, or that it is likely to occur in Montana. It is stated (p. 186, col. 1, para. 2, under LAND) that land subsidence is a possible consequence of excessive groundwater withdrawals.

Groundwater occurs in many types of formations in eastern Montana, including sandstone, limestone, coal, alluvial deposits, and glacial deposits. Freeze and Cherry (1979) note that one feature that is common to all groundwater withdrawal-induced land subsidence sites is the presence of a thick sequence of unconsolidated or poorly consolidated sediments forming an interbedded aquifer-aquitard system. This condition may be present in areas of Sheridan County where there is a potential for large withdrawals of groundwater.

33. **Comment**: Throughout the draft EIS it is stated that wetlands and lakes connected with aquifer use would decrease in size and "eventually be eliminated" (p. S-3, col. 1, para. 2). Furthermore, discussing detrimental effects of aquifer use, the words "loss" and "eliminate" are used in conjunction with wetlands and lakes (p. S-4, col. 1, para. 2); p. 160, col. 1, para. 2; p. 131, col. 2, para. 6; and others). There is no question that aquifer use will affect some wetland values; the draft EIS makes it sound as though this use will be the only factor contributing to the loss, elimination, and drying up of wetlands and their associated habitat. Variable spring and summer runoff and evaporation also will contribute to loss of wetland values, yet no mention or study of these effects is mentioned. Evaporation will be the biggest factor, with or without a water reservation, in the loss of wetlands and associated habitat. Why is all the burden of loss and elimination of wetlands and associated habitat placed on the aquifer use? Aquifer depletion is NOT the only source of wetland effect.

Response: DNRC agrees that groundwater withdrawals are not the only source of wetland depletions; however, reservation withdrawals would be in addition to existing depletions listed in the comment. The focus of the draft EIS is on the impacts of aquifer use only because that is the topic of the document. It is explained in the draft EIS, page 119, column 2, paragraph 4, that drought may account for most declines of both groundwater and lake levels in the period 1982-1990. Also see page 36, column 1, paragraph 1, under WATER LEVELS. DNRC is aware of the high evaporation rates in the area and the dry conditions that have prevailed for much of the last 12 years. The examples that you cited from the draft EIS are referring to possible impacts of appropriating or developing the entire reservation volume requested, which DNRC believes greatly exceeds any estimate of sustainable use.

LEGAL

PRIORITY DATES

34. **Comment**: Are water rights transferred with the property and the same date?

Response: A water right passes with a conveyance of land unless specifically excluded by the deed. Priority is maintained when ownership of a water right is transferred (§ 85-2-403(1993), MCA).

35. **Comment**: In the Poplar River basin, international agreement reduces the U.S.'s share of water, then come tribal rights, then senior rights holders, then DFWP. This seems ridiculous since that much water doesn't exist by that stage. Private irrigators are left out.

Response: Like many rivers in Montana, the Poplar River is already heavily appropriated due to existing claims, international agreements, and tribal compact. Any water reservations the Board might grant on the Poplar River cannot affect these prior existing rights. During the contested case hearing, the Board's hearing examiner will afford all reservation applicants equal consideration. On the Poplar River, the applicants include both the Daniels County Conservation District and DFWP. Irrigation interests, therefore, have the same opportunity to obtain a water reservation as DFWP.

36. **Comment**: What would be the priority date for the reservations? A water reservation doesn't become a water right (beneficial use) until it is put to use. Conservation Districts don't put water to beneficial use--individuals actually put the water to beneficial use.

Response: Water reservations become legal water rights once granted by the Board of Natural Resources and Conservation, regardless of whether they are put to immediate use. In the lower Missouri River and Milk River basins, reservations granted by the Board will be legal water rights with a priority date of July 1, 1985. In the Little Missouri River subbasin, reservations granted by the Board will be legal water rights with a priority date of July 1, 1989.

37. **Comment**: How do reservations, especially DFWP's, affect irrigators' rights?

Response: Under Montana law (§ 85-2-316(9), MCA), the Board of Natural Resources and Conservation cannot grant any water reservations which adversely affect senior water rights. Senior water rights include all rights in effect before the priority date of proposed reservations (July 1, 1985, in the lower Missouri River and Milk River basins and July 1, 1989, in the Little Missouri River subbasin). Therefore, if an irrigator's rights are in fact senior to the proposed reservations, they cannot be affected by the reservations. If, on the other hand, an irrigator's rights are effective after the priority date of water reservations granted by the Board, then they would be junior to the reservations and subject to call. However, the Board has the option to subordinate a water reservation to specific water use permits issued after the priority date of the reservation if it finds that such subordination would not interfere substantially with the purpose of the reservation (§ 85-2-331(4), MCA).

38. **Comment**: Who gets instream flow? Who comes first?

Response: DFWP has requested reservations for instream flow. As described in response to comment 37, senior water rights would come first. The Board would then have to decide seniority among the reservants. Unless reservations are subordinated to permits issued after July 1, 1985, in the Missouri drainage and July 1, 1989, in the Little Missouri, these permits would come last.

39. **Comment**: I (Larry Olson) do not agree with the action of 1985 State Legislature. Allowing application to request an instream flow reservation is one matter. But granting a July 1, 1985 priority date in 1994 is an entirely different matter. Individuals are required to develop beneficial water use permits in a reasonable amount of time. Does DNRC consider 9 years to develop DFWP instream flow reservation application a reasonable time period?

Response: The 1985 Montana Legislature established the priority dates for Missouri River reservations in the lower Missouri River basin as follows: July 1, 1985, for water reservations granted in the lower Missouri River and Milk River basins; and July 1, 1989, for reservations granted in the Little Missouri River subbasin. Although the Board of Natural Resources and Conservation's final decision on water reservations in these basins isn't mandated until December 31, 1994, the 1985 Legislature established these priority dates to discourage speculative water use permit applications during the time from the date the reservation statute was passed to the date of the Board's final decision. It is important to remember, however, that the Board has the option to subordinate a water reservation to specific water use permits issued after the priority date of the reservation if it finds that such subordination would not interfere substantially with the purpose of the reservation (§ 85-2-332(4), MCA).

40. **Comment**: I (Larry Olson) realize that eastern Montana residents are going to have to be more vigilant in observing the Montana Legislature to prevent more problems from occurring in the future. The problem arising is that since 1985, investments in land and in development of land for irrigation have been made based upon beneficial water use permits issued since July 1, 1985. These investments and land use could be jeopardized by lack of available irrigation water if the Board grants DFWP's instream flow reservation request. Although most of these projects would have minimal if any impact upon the DFWP requested reservation, subordination for these projects is not automatic nor is it guaranteed.

Response: The number of permits issued by DNRC after the July 1, 1985, priority date for reservations granted in the lower Missouri and Milk River basins, and the July 1, 1989, priority date for reservations granted in the Little Missouri River subbasin, is shown in Appendix A of the draft EIS. The decision to subordinate water reservations to specific water use permits issued after the priority date of the reservation will be made by the Board of Natural Resources and Conservation alone. How the Board will weigh the opposing interests in such cases is unknown.

41. **Comment**: How will existing and future small reservoirs and other water right developments be affected by reservations?

Response: Existing water developments with priority dates before July 1, 1985, in the lower Missouri River basin and July 1, 1989, in the Little Missouri River basin will not be affected by reservations. Projects with later priority dates would be junior to any reservations granted. However, the Board can subordinate reservations to these projects (p. 5, col. 1, draft EIS). Future small reservoir and other water rights developments would be junior to any water reservations granted by the Board. If water reservations are granted, in some instances they may preclude other water development in the future. Reservations would not preclude wells that pump less than 35 gallons per minute. Reservations could preclude storage, including small livestock impoundments.

42. **Comment**: Page 123 - DFWP should have no right to alter senior water rights.

Response: Reservations would not alter senior water rights.

NOTICE

43. **Comment**: Were the holders of water permits with priority dates after 1985 notified and given the opportunity to object?

Response: Yes, notice of the applications for reservations and of opportunity to object to the applications was sent out to all water right holders (approximately 12,000) in the basin including permittees on February 2, 1994. Notice of the applications and opportunity to object also was published in the Liberty County Times, Havre Daily News, Chinook Opinion, Phillips County News, Plentywood Herald, Sidney Herald, Great Falls Tribune, Billings Gazette, and Miles City Star on February 16, 1994; the Daniels County Leader, Herald News, Glasgow Courier, Circle Banner, Ranger Review, Wibaux Pioneer, and Fallon County Times on February 17, 1994; and the Ekalaka Eagle on February 18, 1994.

44. **Comment**: Why was the public notice of objections sent out with so little time to object?

Response: Section 85-2-331 (1993), MCA, requires the Board to make its final decision on the applications before December 31, 1994. Thus, there is less than a year to allow for notice, objections, responses to the objections, motions and briefs, amendments to the applications, amendments to the objections, prefiled direct testimony, prefiled rebuttal testimony, prefiled surrebuttal testimony, prehearing motions and briefs, the hearing, deliberations, proposal for decision, exceptions, oral argument on the exceptions, more deliberations, and final order. The contested case will require the Board to consider a large volume of complicated information that must be presented in a manner consistent with the due process rights of many diverse potential parties. Even given these constraints potential objectors were allowed approximately one month to file objections and approximately two additional months to amend their objections. The time allowed for filing objections was sufficient and it simply was not possible to allow more time.

45. **Comment**: Why wasn't the objections deadline put off until after the public meetings on the EIS?

Response: The objection process and the public meetings on the draft EIS represent two distinct forums for public input in the reservation proceeding and are not necessarily related. The objection process allows interested parties to object formally or informally to any of the specific water reservation applications that were submitted to DNRC on or before July 1, 1991. Although the deadline for formal objections was March 11, 1994, individuals are welcome to attend the public portion of the contested case hearing to offer informal objections to the reservation applications. Unlike formal objections, informal objections do not require legal representation, prefiled testimony, or cross examination of witnesses. Formal and informal objections will be a part of the record considered by the Board, and the draft and final EIS will be included also.

WATER AVAILABILITY

46. **Comment**: The percentage of water coming across the border from Canada has yet to be determined.

Response: See page 39 of the draft EIS for a discussion of the allocation of water between the U.S. and Canada.

47. **Comment**: Page 189, Criteria - Would "adverse effect impact" criteria include the degree of water availability (how it will add to the existing Milk River problems)?

Response: Yes, water availability will be among the adverse impact criteria used by the Board when deciding whether to grant, grant in part, or deny water reservations. All applicants for reservations were required to submit an analysis of the physical availability of flows for their water reservation requests (ARM 36.16.105B). This information will be used by the Board of Natural

Resources and Conservation, along with all other available information (draft and final EIS and the formal record from the contested case hearing), to determine whether the proposed reservations would adversely affect existing water rights. However, the reservation statutes do not require that water always be available in order for the Board to grant a reservation.

48. **Comment**: An individual application for a permit requires demonstration of available water. Does DFWP have to do similarly for its reservation applications?

Response: Yes, as part of the application process for water reservations, DFWP was required to submit an analysis of the physical availability of flows for its reservation requests (ARM 36.16.105B).

49. **Comment**: (1) The CMR range inventory and the importance of riparian areas in the CMR and the management of those areas for grazing are critical to sustaining wildlife. (2) Surface water in McCone County riparian areas cannot be developed if the Board grants instream flow reservations.

Response: Your comment regarding the CMR range inventory is noted. The amount of water available for future development if instream flow reservations are granted in the Redwater and Missouri rivers is shown in revisions to Appendix J in Changes to the Draft EIS.

50. **Comment**: Instream flow requests by DFWP are in addition to tribes' (tribes of the Fort Peck Indian Reservation) rights and together would prevent further development.

Response: The tribes of the Fort Peck Indian Reservation have water rights that would be senior to any reservations granted to DFWP. DFWP has requested instream flows on the Poplar River and West Fork of the Poplar River upstream of the Fort Peck Indian Reservation boundary. The tribes have instream flow rights on both of these streams where they flow through the reservation. During most of the year, tribal instream rights on these streams--which are generally larger than DFWP instream flow requests--may limit new consumptive use development on these streams above the reservation boundary. If granted, DFWP channel maintenance reservations could further limit new water developments during spring runoff.

Table 3-3. Flows (in cfs) remaining in the Missouri River after DFWP reservation requests[a] and Fort Peck Compact rights[b] are subtracted[c]

Missouri River at Wolf Point

% FLOW	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANN
10th%	6051	7393	7376	9431	11366	11598	8974	4095	3743	7823	6730	6422	6475
20th%	3910	5215	7211	8725	10559	8707	7176	2540	1330	6423	5531	5569	5369
50th%	0	0	6841	7925	9464	6548	2937	0	0	2711	2387	2340	3086
80th%	0	0	6262	7490	8079	4735	0	0	0	411	0	0	740
90th%	0	0	5621	7243	6820	3308	0	0	0	0	0	0	172

Missouri River at the Montana-North Dakota border

% FLOW	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANN
10th%	6443	7215	7590	9616	11412	13580	12208	4673	4141	8511	6673	6826	7276
20th%	3706	5110	7276	8478	10956	10056	8133	3017	1861	7238	5902	5789	6010
50th%	0	0	6705	7924	9640	7337	4014	0	0	3091	2381	2498	3612
80th%	0	0	6033	7283	8381	5581	880	0	0	712	0	0	1294
90th%	0	0	5513	7048	6705	4077	0	0	0	0	0	0	346

[a] Reduced DFWP requests are given in Table J-1

[b] The allowable annual tribal consumptive use (525236 af) was distributed as follows: Oct-Mar 0, Apr 11 cfs, May 505 cfs, June 1546 cfs, July 3082 cfs, Aug 2473 cfs, Sept 1008 cfs

[c] For example, during October of a very wet year (10th%), 6,051 cfs would be available after DFWP's reservation and Fort Peck Compact rights are satisfied

The tribes have consumptive use rights for large amounts of water from the Missouri River (p. 41, col. 2, draft EIS), including provisions for marketing this water. If these water rights are developed in full and DFWP's reservations are granted with first priority to the maximum amount allowed by law, much of the Missouri River's flow would be unavailable for other new uses (Table 3-3). Even if reservations are granted, the marketing provisions could allow further development, albeit at a cost.

51. **Comment**: Page S-3 - Impacts Under the Chosen Alternatives - Granting the DFWP instream flows at the level requested could have a negative impact on various fisheries by maintaining the status quo concerning water levels in certain stream reaches. Storage has the potential to improve low flows, and the granting of channel maintenance or upper inflection point instream flows may render a feasible project difficult to consider. Instream flows, as requested, would make it very difficult to develop a storage reservoir that could benefit irrigators and downstream fisheries.

Response: Granting any reservation would leave less water legally available for other junior uses, including water storage. A case-by-case analysis would be needed to determine whether future water storage benefits would be foregone if reservations are granted. Also see pages 125 and 126 of the draft EIS.

LEGAL STANDING

52. **Comment**: The statement (p. S-3, col. 2, of the draft EIS) that "This same legal right allows holders of water reservations to object to water right claims submitted in the statewide adjudication proceeding" is of questionable value. According to Judge Loble, this issue has never been addressed by the Water Court and needs to be legally resolved. The governing statutes (§§ 85-2-233(1)(a) and 85-2-232(1), MCA) appear to give standing to the DNRC, water right claimants, permit holders, reservation holders and "other interested persons who request service of the notice from the water judge." The statutes seem to imply that anybody can file an objection, forcing a hearing by the water judge. Clearly, this doesn't seem right. The question of who has standing will have to be decided by the court. The statement needs to be eliminated from the EIS or rephrased to emphasize that it is merely an untested opinion of the DNRC. If the statement remains, the discussion needs to be expanded to inform the readers of the vast array of persons and entities who potentially have standing in the adjudication. By singling out reservants (particularly DFWP), the implication is that the reservants are gaining a power--standing to object--not shared by others, or a power they don't already have. DFWP does not rely on existing reservations to gain standing in the adjudication. Our (DFWP) participation is based on other grounds not tied to reservations and denying us a reservation would not eliminate our participation in the adjudication process.

This statement is repeated on page 123 under State Water Rights Claims and Permits. It says "reservants also would have the right to participate in the adjudication process where final decrees have not been issued."

Response: The statement in the draft EIS regarding a reservant's standing in the adjudication process is correct. The statutes governing standing in the adjudication (§§ 85-2-232(1) and 85-2-233(1)(a)(1993), MCA) specify that reservants have standing to object in the adjudication. Although the same statutes purport to provide standing to "other interested persons," these other interests are not specified. It would be up to the water judge to determine whether an unspecified interest was sufficient to impart standing. While a potential reservant may or may not have sufficient interest for standing to object to the adjudication based on some unspecified interest, he or she clearly would have standing as a reservant. DFWP is correct that the statutes governing standing in the adjudication might impart standing to a very broad range of objectors other than reservants and that DFWP may not need a reservation to participate in the adjudication. Also see DNRC's Changes to the Draft EIS.

53. **Comment**: I (Arthur Kleinjan) would be very upset if objections are submitted by persons or groups that do not hold water rights. Can a county object based upon public interest?

Response: Yes. The provision for standing to object in water reservation proceedings is very broad, granting standing to anyone whose property, water rights, or interests might be adversely affected (§ 85-2-308(1993), MCA). "Interests" has yet to be defined, but since property and water rights have been mentioned specifically, the term would include more than just those specific interests. Since one criterion for a reservation is public interest, a county, as a public entity, can object on that basis.

54 **Comment**: In November of 1911, the United States Department of Interior Bureau of Reclamation and 19 other parties entered into an agreement recognizing existing water rights and contemplating the use of unappropriated water in the Milk River. This stipulation preceded construction of the Milk River project. Section 6 of the agreement states, "All waters occurring in Milk River or its tributaries at any time during the irrigation season in excess of the actual rights and beneficial use by each and any of the present landowners, as able limited shall be recognized by the parties hereto as subject to and available for storage and diversion by the United States and all waters occurring during the nonirrigating season from September 16 to March 1, of each years, as well as all waters diverted from St. Mary or other drainage basin shall be likewise available for use by the United States, in the reclamation of lands under the terms of the aforesaid acts." From this agreement, it would appear that there are no unappropriated waters remaining in the Milk River or its tributaries.

Response: When it was drafted, this agreement was an appropriate method of settling priorities and related water rights issues. However, only the parties entering into the agreement were limited by its provisions. The stipulation did not bind the State of Montana, nor did it excuse BUREC from following appropriate water law in developing its past or future water rights. Although Section 6 of the agreement clearly stated BUREC's recognition of the other parties' existing water rights and identified BUREC's intent to treat all other waters as unappropriated and available for development, it did not allow BUREC to claim those unappropriated waters in perpetuity. To legally obtain rights to those unappropriated waters, BUREC (like any individual or organization) is required to comply with the appropriate state laws, which among other things require the development of those rights with due diligence. Water above and beyond that put to beneficial use, under an existing right prior to 1973 or by permit issued after 1973, can only be appropriated according to the provisions and limitations of the present statute. Currently, the State of Montana is performing a comprehensive statewide adjudication of all pre-1973 water rights to determine their validity.

55. **Comment**: Rights have yet to be adjudicated, so if DFWP is granted reservations, water rights holders waiting on the adjudication process would become junior.

Response: In 1979, the Montana Legislature initiated a comprehensive, statewide, general adjudication of water rights that originated legally before July 1, 1973, the effective date of the Montana Water Use Act. This process required all holders of pre-1973 water rights to file a claim for those rights and was undertaken to determine their validity. Under the adjudication process, any water claims that are determined to be valid will retain their priority date and will be senior to any water reservations that the Board might grant. Furthermore, until that decision is made, all rights being considered in the adjudication process will retain their original priority date.

56. **Comment**: An impact which should be discussed in the draft EIS concerns the effect of granting DFWP instream reservations and providing DFWP objector status to other water rights. It is clear that the primary motivation for instream flows in the upper Missouri River basin was not to protect stream flows from further diversion, but to, in fact, obtain objector status on the various sources in question. This potential impact should not be ignored by DNRC in the preparation of any EIS on the lower Missouri basin. For example, if the Missouri River streambank moves due to Corps' operations, and pumps have to be moved necessitating changes in the point of diversion, DFWP could gain standing to object. How far will DFWP go to achieve it's flows? At whose cost?

Response: A reservation may give reservants a stronger basis to object to permit applications and changes in junior and senior water rights. If DFWP objected to changes in senior water rights, it would be required to follow the same objection process as any other objector. For its objection to be upheld, DFWP would have to show that its reservation or other interests, relevant to the criteria for issuing permits and making changes, would be adversely affected. We cannot speculate whether DFWP will routinely object to permit applications and changes if granted a reservation in the lower Missouri basin. On some streams where it has existing rights, DFWP already claims standing to object. Also see response to comment 52.

Regarding DFWP's motives for reserving water, DNRC is only aware of those purposes presented in DFWP's reservation application. These are summarized on page 20 of the draft EIS.

LEASING

57. **Comment**: Under Montana code, if DFWP is granted a reservation, can they at a future date lease water from that reservation?

Response: No. The water reservation statute excludes reserved water from the state water leasing program. See § 85-2-316(16)(1993), MCA.

58. **Comment**: Would "water leasing" of existing rights be affected by reservations?

Response: Instream reservations would not affect the leasing of water rights with a priority before July 1, 1985, in the Missouri and Milk River basins and before July 1, 1989, in the Little Missouri River basin. Please see page 5, column 2, of the draft EIS for a discussion of water leasing for instream flows.

59. **Comment**: Page 4, paragraph 2, under Water Reservations - The statement that "the water reservation statute is the only means to acquire a water right for instream flows to protect water quality, fish, wildlife, and recreation" is incorrect. This statement only applies after July 1, 1973, when the reservation process was enacted. Prior to July 1, 1973, instream rights existed under other legislation. These instream rights are being quantified in the current statewide adjudication.

Response: A water lease would give DFWP a right to use an existing water right for instream flows for a set time; the water right is still retained by the owner. The leases can be issued for a term not to exceed 10 years, and the water right holder is under no obligation to renew the lease. A new water right for instream flows can only be obtained through a reservation. Please see page 5, column two of the draft EIS for a discussion of water leasing.

In 1969, the Montana legislature authorized DFWP to file for "Murphy rights" to protect flows on blue ribbon trout streams. DFWP filed on six streams in the Missouri basin, all of which are upstream of Fort Peck Dam. By statute, DFWP can no longer file for Murphy rights instream flows; a new water right for instream flow can only be obtained through reservation. DFWP's Murphy rights are undergoing review in the adjudication process.

50 PERCENT LIMIT

60. **Comment**: Current Montana law, § 85-2-316, MCA, #6 does not allow for adjudication to exceed 50 percent of the average annual flow in the lower Missouri; therefore, Fish, Wildlife and Parks' concerns are basically addressed.

Response: The adjudication process does not place any limits on the amount of water that can be claimed from any source. Section 85-2-316(6)(1993), MCA, places an upper limit on the amount of water that can be reserved for instream uses under the reservation statute. This 50 percent limit does not apply directly to the adjudication process. The Board will use the information presented at the contested case hearing to determine how much water, if any, is needed for DFWP's reservation.

61. **Comment**: With respect to the limit placed on what the Board of Natural Resources and Conservation can grant for instream flows on gauged streams--50 percent of what? The flow that year or average?

Response: Instream flow reservations granted on gauged streams are limited to 50 percent of the average annual flow of record (§ 85-2-316(6), MCA). See response to comments 4 and 11.

BASIN CLOSURE

62. **Comment**: How are legal and administrative basin closures established? How does closure affect the reservation process?

Response: Basin closures are accomplished administratively upon petition to DNRC by the users of water in the source of supply, or by DHES as outlined in Section 85-2-319(1993), MCA. DNRC will implement the closure if it is established in the process that water for new development is not available or that development would adversely affect water quality. Basin closures also may be established by legislation. The effect of a basin closure on reservations would depend on the terms, exceptions, and timing of the closure. A closure could prevent potential water users from further developing the water.

63. **Comment**: Granting instream flow reservations in the lower Missouri basin would effectively close it to any further beneficial uses. The EIS does not point out that other basins in Montana have been closed because of the reservation process.

Response. If the Board grants instream reservations with first priority, little water would be available for other uses during dry years on most streams (see revisions to Appendix J in Changes to the draft EIS). The Board could grant instream reservations, while reserving water for municipal and irrigation use with a higher priority. Under this scenario, water would be available for these consumptive uses before instream reservations.

On page 5 of the draft EIS, it was pointed out that the Jefferson, Madison, and Teton River basins, and the Missouri River basin above Morony Dam were closed to most new water use permitting by the 1993 Legislature subsequent to the Board's approval of reservations in the upper Missouri River basin water reservation proceeding.

ADJUDICATION

64. **Comment**: The draft EIS doesn't substantiate USFWS's water right claims on Medicine Lake Wildlife Refuge.

Response: The draft EIS did not attempt to validate any claims made in the adjudication process.

65. **Comment**: Why aren't water reservations and post-1973 claims included in the adjudication process? Would water reservations affect pre-1973 claims?

Response: The 1972 revision of Montana's constitution mandated that the state recognize and protect existing water rights. At that time a comprehensive inventory of these water rights had not been developed. Recognition, protection, and management required some type of determination of what water rights were established. Montana's Statewide Stream Adjudication, now administered by the Montana Water Court (Title 85, Chapter 2, Part 2), is the legislatively established method to record (accomplished through the filing of a Statement of Existing Water Right Claim), quantify, and therefore protect these rights. (Existing water rights are statutorily defined as those water rights developed prior to July 1, 1973, the effective date of the Montana Water Use Act.)

Water rights developed after July 1, 1973, are recorded and quantified as they are developed through exclusive administrative processes managed by DNRC (Title 85, Chapter 2, part 3). The administrative process replicates in many aspects the quantification requirements of a stream adjudication. These new water rights are blended into the record system with pre-1973 rights included in the adjudication process. Finally, day-to-day management of new water rights relies upon the same ranking of priorities and, when necessary, the jurisdiction of the local district court and its appointed water commissioner.

66. **Comment**: Shouldn't the adjudication be completed first, so we know if water is available for reservations?

Response: Montanans have been appropriating and using water without a completed statewide adjudication since the late 19th century. In 1973, the Montana Legislature initiated an adjudication of existing water rights and two processes for issuing new water rights--water reservations and provisional water use permits. The adjudication will take many years to complete. By law, the Board must reach its decision on water reservation applications by December 31, 1994.

67. **Comment**: Is groundwater included in the adjudication process?

Response: Yes, but domestic wells under 35 gallons per minute and stock water uses are not included.

68. **Comment**: On other streams, has the adjudication (final decrees) been considered in the reservation process?

Response: The adjudication and final decrees on streams are considered in the reservation process. The legislature established priority dates for reservations that are junior to these prior rights.

FEDERAL RESERVED RIGHTS

69. **Comment**. Page 42 - The Medicine Lake wilderness may have an implied water right. The Service (USFWS) has not determined if a federal reserved water right will be asserted for withdrawn lands in the sand hills section of the refuge or linked with the 1976 wilderness designation.

Response. Comment noted. To date, no agency has formally claimed a federal reserved water right for the wilderness area within the Medicine Lake National Wildlife Refuge. We cannot speculate at this time what the extent of this water right may be--if in fact it exists--and how it may affect or be affected by the proposed reservations.

70. **Comment**: Page 42, Table 4-3 - The Fort Peck tribes have tribal "water reservations" on Big Muddy Creek. These established rights may provide some instream flow protection (legal water rights).

Response: The tribes of the Fort Peck Indian Reservation have federal reserved water rights for instream flows on Big Muddy Creek where it borders the Fort Peck Indian Reservation (p. 42, Table 4-3, of the draft EIS). No public entity has applied to reserve instream flows through the water reservation process in Big Muddy Creek.

71. **Comment**: Where would the tribes of the Fort Peck Indian Reservation measure their instream rights?

Response: The tribes have not yet developed a measuring, monitoring, or enforcement plan for their instream flow rights.

72. **Comment**: In tribal districts [lands within the boundaries of the Fort Peck Indian Reservation], what is the case for those who are part of tribal compact but are private irrigators?

Response: In most cases, non-Indian irrigators cannot use Fort Peck Compact water unless the Tribe transfers or markets a portion of its rights to them. Exceptions include persons receiving water from the Fort Peck Irrigation Project, and some non-Indian successors-in-interest. Other non-Indian users of water within the boundaries of the Fort Peck Indian Reservation may apply for water rights through the state water use permitting process, or public entities may apply through the water reservation process.

OTHER

73. **Comment**: a) In the water reservation review process, will the Board allow new evidence?

b) Will new rules of evidence be admissible in court?

c) We need to prevent the current process from becoming too rigid.

Response: a) The Board has appointed a hearing examiner to hold a formal contested case hearing on the applications. Both applicants and objectors will be allowed to present testimony and evidence at the hearing. At the conclusion of the hearing, the record will be closed and new evidence will not be allowed thereafter. The Board will makes its decision based on the evidence presented at the hearing. See page 2 of the draft EIS.

b) Evidence submitted and accepted in the contested case becomes part of the record that will be reviewed by a court if the Board's decision is appealed. A court's review of the Board's decision would be limited to the record. See page 4 of draft EIS.

c) The Board is required by statute to conduct the hearing according to the contested case process of the Montana Administrative Procedure Act.

74. **Comment**: The idea of instream flows is contrary to Montana water law according to Ed Ingold, President of Wyoming Trout Association, from U.S. Water News, January 1990. Trout interests want to shoot holes in senior water rights. Address how instream flows are counter to Montana law tradition.

Response: Montana law allows public agencies to reserve water instream for beneficial use and specifies that fish, wildlife, and recreation are beneficial uses. Instream flow reservations do not require a diversion or impoundment as is required for traditional water rights, but instream flow reservations are subject to the customary rules of priority. See pages S-2, 3-4, and 122-123 of the draft EIS.

75. **Comment**: Why do government agencies (i.e., municipalities, conservation districts, Fish, Wildlife and Parks) get to apply for reservations but "private" individuals do not?

Response: The legislature authorized only public agencies to apply for water reservations. However, private agricultural operations will use the water reserved by conservation districts, and water reserved by municipalities will be used primarily by the private sector. Moreover, private individuals also may obtain water rights for new water uses through the new use permitting or change authorization processes. The Board may subordinate the reservation to permits granted between the reservation's priority date and the date of the Board's decision.

76. **Comment**: The EIS does not point out legal questions which should be addressed.

a) Can Fish, Wildlife and Parks sell part of its reservation at some future time?

b) Does a reservation allow Fish, Wildlife and Parks to condemn lands to access its water reservation?

Response: a) No. Although a reservation may be transferred to another entity qualified to hold a reservation, the entity receiving the reservation must agree to meet the objectives of the reservation (§ 85-2-316(13)(1993), MCA). Since the objective of DFWP's reservation is minimum instream flows for fish, wildlife, and recreation, subsection 13 eliminates any possibility that DFWP would sell part of its reservation.

b) A reservation does not create any powers to condemn property and DFWP is otherwise without power to condemn lands to access a water reservation.

77. **Comment**: a) How does the "right" to transport water downstream work (conveyance of water rights under state law)?
b) How does this enforcement work?

Response: Under state law, water appropriated under an existing right or permit may be turned into a natural stream channel for use at some point downstream if the stream is not diminished in quality or quantity to the detriment of another water user. Water turned into a natural stream for conveyance to a downstream place of use does not become available for appropriation by other water users. A water user using this method of water transport must be prepared to prove the amount of water in the stream contributed by the user. This type of water right is enforced in the same manner as other water rights.

78. **Comment**: Who pays the water commissioner fee?

Response: Water commissioners are paid by the water users. DNRC may pay a portion of the fees if it applies for the appointment.

79. **Comment**: We (Arthur Kleinjan and Pete Kuhr) are very concerned with the objection fee. Why is it required? How can it be changed?

Response: The Board may prescribe fees for recouping the costs of processing and conducting administrative hearings (§ 85-2-113(1993), MCA). Because administrative contested cases are triggered by objections, the Board set a fee for objections by administrative rule. The fee might be changed by petitioning the Board to change the rule.

80. **Comment**: Why aren't there opportunities to reallocate water at a later date?

Response: Under certain circumstances, the reservation process does allow for future reallocation of reserved waters. Such reallocation can occur during the Board of Natural Resources and Conservation's review of the reservations it grants (required by law at least once every 10 years). During this review, if the Board finds that the objectives of a reservation are not being met, that reservation can be revoked or modified. Any water made available in this process is available for appropriation by others.

In the case of instream flows granted by the Board, all or a portion of the flow may be reallocated to a different use if the applicant for reallocation is a qualified reservant and can show that the instream flow is not required for its purpose and that the need for reallocation to the applicant outweighs the need shown by the original reservant (§ 85-2-316(11), MCA). Reallocation of instream flow reservations, however, is limited to once every five years (per reservation).

81. **Comment**: Why doesn't the state obtain a "block" for future reallocation?

Response: Water reservations are unique in that they are legal water rights (much like water use permits), but they do not require immediate or near-term development of the reserved waters. All reservations, therefore, are a means of "blocking" water for future use. This is especially the case when conservation districts obtain water reservations since the reserved waters can be held ("blocked") for future consumptive uses for years and even decades into the future. The eventual development of reserved waters, however, must satisfy the uses originally proposed in the reservation application. Reallocation for other uses would require the satisfaction of several criteria. For reallocation, a qualified reservant must demonstrate that the reservation is no longer required for its purpose and that the need for reallocation to the applicant outweighs the need shown by the original reservant. Reallocation of instream flow reservations is limited to once every 5 years (per reservation).

82. **Comment**: A water reservation becomes a water right when granted. Sad that only agencies can hold water reservations.

Response: Comment noted. Keep in mind, however, that individual irrigation projects make up the water reservation applications of the 11 conservation districts involved in the Missouri River Water Reservation Proceeding. See the response to comment 75 for a discussion of the use of water reservations by individuals.

83. **Comment**: State law protects instream flows to the Gulf of Mexico.

Response: No state law ensures that water reserved for instream flows will be protected to the Gulf of Mexico. While an instream flow reservation (if granted) may require upstream junior water users to leave water in the stream, there is no such requirement for water to be left instream in reaches downstream from the reservation unless there is a senior downstream water right.

84. **Comment**: Page S-3 of the draft EIS under Legal Water Availability says that pre-1985 rights on permits are protected. In the same paragraph, the last sentence refers to judicial relief to protect water rights. No individual in Roosevelt County or county government would want to be placed in a position of having to seek judicial recourse against DFWP to protect his or her interests.

Response: DNRC understands your concern. Please remember, however, that seeking judicial relief from the district court is an option available to DFWP (and all other reservants) when seeking to protect their reservations from junior water use permits. Reservants cannot enforce their priority against senior water rights.

85. **Comment**: The EIS says the Board may change, modify, extend, or revoke a reservation at a future date. We are all well aware that any change will be accompanied by a lengthy court battle requiring financial resources beyond an individual's ability to pay, which in effect is a closure to resource development.

Response: Judicial proceedings are not a requirement for the Board to change, modify, or revoke a water reservation in the future. Such changes for water reservations require only that the Board determines that the objectives of the reservation are not being met. Parties may choose to seek judicial review of the Board's decision.

86. **Comment**: Changing or restricting land use through legislative action which in turn has lowered land values has been heard by the United States Supreme Court.

Response: The water reservation statute provides a means for appropriating the state's water. The statute in no way regulates or restricts land use. Also see response to comment 112.

STORAGE

87. **Comment**: On the Milk River, instream flow would block the development of new storage projects.

Response: Granting instream reservations in some instances (Milk River included) could prevent the development of upstream irrigation and new storage that would require new water rights. The amounts of water unavailable as a result of instream reservations would have to be determined on a site-specific basis. Revised Appendix J (see Changes to the Draft EIS) includes the monthly flows (during wet, average, and dry years) by stream that would remain after instream flow requests are subtracted. Appendix J does not take into account the water that already might be appropriated by other senior water right holders. If these rights are adjudicated as claimed, water availability for storage will be severely limited, even if no water is reserved for instream purposes.

88. **Comment**: Page 125 - Would dams be a better way to provide instream flows?

Response: Reservoir storage could be used to provide water for instream flows. One limitation to using reservoir storage for providing instream flows is cost. The costs of reservoir storage are discussed on pages 125 and 126 of the draft EIS. A case-by-case analysis would be necessary to determine the costs and benefits of using storage to provide instream flows on a particular stream. However, storage options are limited and probably would not provide all the flows requested.

89. **Comment**: Page 126, third paragraph - The presentation of the hypothetical reservoir analysis is noted. Instream flow reservations are likely to have detrimental impacts on future storage in the basin and should be analyzed at this point in the draft EIS.

Response: DNRC used the hypothetical reservoir analysis on page 125 to provide an example of how water reservations, if granted, may affect the feasibility of water storage. In this example of a hypothetical reservoir on Boxelder Creek, it was pointed out in the draft EIS that including DFWP's requested channel maintenance flows would reduce reservoir yield substantially, and the per-acre-foot cost of storing water in the reservoir would increase markedly. Lacking specific proposals for storage projects in the basin, DNRC will not speculate on the extent that instream reservations are likely to have detrimental impacts on future storage in the basin. However, the hypothetical analysis shows that reservations have the potential to affect future storage in the basin. Such analysis would require a site-specific look that is beyond the scope of this EIS.

WATER QUALITY

90. **Comment:** Page 126 - The discussion of water quality is confusing. The following points might clarify the issue.

a) Dewatering of a dirty tributary would have a positive effect on the Missouri main stem.

b) Dewatering of a clean tributary would have a negative effect on the Missouri main stem.

c) Dewatering of the Missouri main stem above a dirty tributary would have a negative effect on the Missouri main stem.

d) Dewatering of the Missouri main stem above a clean tributary would have a positive effect on the Missouri main stem.

e) Dewatering of the Missouri main stem below the last tributary would have no water quality effects (positive or negative).

Response: Water quality issues can be complex. In general, factors that reduce the loads of pollutants (sediment, nutrients, harmful trace-elements) have a positive effect on water quality. Factors that increase the loads of pollutants have a detrimental effect on water quality.

91. **Comment**. During the summer, streamflow in tributaries to the Milk River results from rainstorms falling on hardpan prairie. This runoff is very muddy and does nothing to improve water quality. Building small storage projects could provide sediment traps that would benefit water quality, but the proposed instream reservations would preclude construction of such storage projects.

Response: Instream flows generally consist of two components. Channel maintenance flows serve to preserve the hydraulic forces that transport sediment and maintain the shape and stability of the channel. These are generally high and often muddy flows that occur during spring runoff, and they are both natural and necessary. Without such flows, sediment would accumulate in the channel, ultimately reducing its capacity to convey flow. The resulting unstable channel could affect a variety of beneficial uses, including the ability to carry normal flows and the quality of aquatic habitat. Minimum flows provide for maintenance of water quality (dilution flows) during low flow periods.

Northern tributaries of the Milk River and streams in the Little Missouri basin flow through rock types (shales, sandstones, siltstones) that cause high natural sediment loads. Dams have a mixed effect on sediment loads. Over the short term, a dam may improve physical water quality by reducing sediment loads downstream. However, this may cause the downstream channel to scour and increase bank erosion. Over the long term, dams in areas with high sediment loads tend to fill rapidly with sediment, after which inflowing sediment loads are passed downstream.

Instream reservations could limit the amount of water that otherwise might be available for storage. Revised Appendix J (see Changes to the Draft EIS) shows the amount of water available after instream flows are satisfied. A site-specific analysis would be required before the difference in water quality impacts with and without the instream reservations could be determined. Such an analysis is beyond the scope of this EIS.

92. **Comment**: TDS issue would be a paramount concern to irrigators. TDS is already high. (Do not consider DFWP request.)

Response: As indicated in revised Figure 4-11 (see Changes to the Draft EIS) and on page 49, total dissolved solids concentrations (TDS) are high. Concentrations in excess of 1,000 mg/l may limit useability of water for irrigation. The DFWP request for instream flow would tend to keep water in the stream at low flow and prevent TDS from increasing.

93. **Comment**: Page 45, paragraph 2 - Please provide the information which was relied upon for the statement regarding the contribution of non-point source pollution to water quality concerns on the lower Missouri River basin. The 90 percent figure apparently comes from data contained in the State Water Quality Bureau, Section 305(b) Report. The report should be specifically disclosed if any information which was contained in that document was used for this analysis. Water quality analysis

in the draft EIS should contain additional data regarding return flow and their positive effects on stream flow and water quality. There should be an analysis throughout the EIS that under Montana water quality law and federal water quality law, new or increased sources of nonpoint pollution, such as irrigation projects, will be adhering to measures mandated under these laws. Therefore, any analysis that new water development projects will somehow impair or inhibit water quality is not accurate under the mandates required by law.

Response: The statement in the draft EIS is based on a generalization that applies to Montana as a whole; the Section 305(b) report (MDHES-WQB 1992) is the source. The report is a public document and is available from the Water Quality Bureau.

Extensive documentation shows the potential adverse effects of irrigation return flows on ambient water quality in surface and groundwater (Battaglin et al. 1994; Bouwer 1987; El-Ashry et al. 1985; Engberg and Sylvester 1993; Feltz and Engberg 1994; Nimick et al. 1994; Novotny and Chasters 1990; Sherpherd 1994; and Quinn 1982). This is especially so in semiarid environments with salty soils (the reservation process screened out the very saline soils, but all soils contain mineral salts that are potentially leachable). Much applied research has been conducted and one of the "best management practices" developed to reduce agricultural pollution from irrigated land involves the reduction of return flows through "deficit irrigation." This practice requires careful water management to provide only the amount required for plant growth. Return flows are kept as small as possible.

Potential positive effects of irrigation return flows on streamflow and water quality are less well documented. In general, return flows have the potential to improve streamflows and water quality. Water applied in excess of crop requirements early in the irrigation season (April-June) is stored in the soil profile and shallow aquifers; this stored water moves slowly and becomes available for streamflow during late season (August-October) when flow may be absent or very low. Small streamflows typically have large concentrations of TDS and may have elevated water temperatures and reduced dissolved oxygen. For late season return flows to improve water quality, the following conditions must be met:

1) The initial quality of applied water must be good (low in TDS, nutrients, trace-elements) and the soil and shallow aquifer materials that return flows percolate through must be low in salt and other potentially harmful substances. These conditions are necessary if the return flow is to have a dilution effect on late season flows. If the return flows have a larger concentration than the low flow in the stream, water quality will decline.
2) Return flows are not used and reused until they become so salty that dilution benefits are lost.
3) Water quality will not be improved by return flows unless soil and shallow aquifer materials pass water at an appropriate rate. If the materials are too "leaky," water will move too quickly to improve late season flows and quality. If the materials are too "tight," water will move too slowly or may not be stored in the aquifer at all.

In semiarid environments, the concentration of TDS in the root zone is typically two to three times that in the applied water. This occurs primarily due to consumption of water by plants. Shallow aquifers underlying irrigated parcels contain salts that may be leached, causing a further increase in TDS concentration of return flows. The irrigation water is sometimes salty to begin with. These factors indicate that chemical water quality in the study area is more likely to decline than improve as a result of irrigation development.

As irrigation results in the consumption of water, the concentration of TDS and other chemical constituents (with the possible exception of arsenic under some conditions) will increase in surface water and groundwater. Whether this increase is considered impairment depends on two factors:

1) Whether the increase is large enough to affect other beneficial uses.
2) Interpretation of various state and federal water quality laws.

As indicated in the draft EIS, irrigation in some areas under certain alternatives is likely to cause a significant decline in water quality. In other areas, the effects are likely to be small.

Under the proposed Montana Water Quality Standards (WQB.VII, WQB, 1994, MDHES-WQB) and draft nondegradation rules, it is unclear where the line will be drawn that separates impairment and nonimpairment and what will be considered a violation of water quality laws. It appears that it will be possible to develop a project using "best management practices" and by definition not be in violation of standards or nondegradation rules, even though some limited impairment of water quality results. The nondegradation rules essentially seek to define an acceptable level of impairment. How these new laws are interpreted and enforced remains to be seen.

94. **Comment**: Page 46, Arsenic Concentrations - Although mentioned in later portions of the draft EIS, it should be noted that important research is being conducted by DNRC in conjunction with MSU regarding arsenic and the absorbative capacity of soils to help arsenic concentrations in surface water. Any potential benefits of irrigated agriculture on the arsenic problem are generally overlooked in the draft EIS. Although the research is preliminary, this study should be mentioned for consideration by the Board.

Response: The discussion of continuing arsenic research is not presented on page 46 in the section describing water quality parameters, but is discussed on page 127 in the water quality impacts section. Potential reduction of arsenic loads and concentrations can occur only where arsenic is contained in the applied irrigation water. Irrigation that consumes water lacking arsenic will remove dilution flows and cause arsenic concentrations to increase (see response to 97).

Continuing arsenic research is designed to more fully evaluate the short- and long-term effects of irrigation on arsenic in surface and groundwater. The project is titled "Arsenic Transport and Mobility in Surface Water, Irrigated Soils, and Shallow Groundwater of the Upper Missouri Basin," and is funded in part through the Resource Development Grant Program administered by DNRC. Cooperators include the DNRC Water Management Bureau, U.S.Bureau of Reclamation, U.S Geological Survey, and Montana State University Plant and Soil Science Department. The project was initiated July 1, 1993, and will be completed in July of 1996. While it focuses on the upper Missouri above Canyon Ferry, some of the results should be transferrable to the lower basin.

One goal of the investigation is to evaluate the long-term mobility of arsenic stored in the soil profile of irrigated fields. Irrigation with water containing arsenic has potential to reduce concentrations in downstream surface water over the short term, but if this stored arsenic is remobilized and moves into groundwater or surface water at a later date, the long-term effect may be more harmful than maintaining the existing, preirrigation conditions.

95. **Comment**: Page 51, paragraph 7 - The specific impact of water reservation development on water quality in Medicine Lake should be addressed at this stage.

Response: Water quality impacts of the reservations in the Sheridan County Groundwater Area are discussed on page 131 of the draft EIS. Given the uncertainties concerning the level and location of potential groundwater developments and the complexity of lake chemical processes, reliable estimates of the effects on Medicine Lake water quality were not possible beyond those presented regarding the Westby-Dagmar aquifer and the Big Muddy Creek basin. Additional study would be required and has been included in the Coordinated Groundwater Development Alternative discussed in the draft EIS.

96. **Comment**: Pages 126-127 - The conflicting comments on page 126 in the second paragraph under the water quality heading, and the fourth paragraph on page 127 should be explained. On one hand, the analysis states that irrigation projects have the greatest potential to affect water quality, and on the other hand, the analysis states that there would be little difference in the effect of the alternatives on stream flow and water quality conditions. Furthermore, the analysis regarding water quality should assume that any new or increased irrigation project would be subject to mitigation requirements under Montana's Water Quality Act. The impacts on water quality under state and federal environmental laws will be minimal or nonexistent. The draft EIS should note that the impacts will generally be minimal as mandated by law.

Response: The seeming "conflict" referred to is between the following statements. On page 126 of the draft EIS: "Reservations for irrigation projects have the greatest potential to adversely affect water quality. . . ." On page 127: "As shown in Figures 6-1 through 6-12, there may be little difference in the effect that the Consumptive, Combination, Instream, and No Action alternatives have on the seasonal distribution and volume of streamflow. In these situations, the range of effects on water quality should be similarly small." (Emphasis added.)

These statements are not contradictory. Of the possible options for reserving water (municipal, instream, irrigation), reservations for consumptive irrigation use have the greatest potential for adverse effects on water quality. However, as shown in Figures 6-1 through 6-12, there are situations where the proposed consumptive use is small and the difference between alternatives (Consumptive, Combination, Instream) also is small. In these situations, the difference in water quality impacts between the alternatives also is small. This observation is consistent with the conclusions stated in the water quality impacts section.

Where there is a large contrast in consumptive withdrawal between alternatives, such as in the case of dry years on the Missouri River near the state line (Figure 6-3, bottom of page), there is a significant difference in predicted water quality effects between the alternatives.

As discussed under comment 93, the effect of enforcing the Montana Water Quality Act and nondegradation rules on water reservations for irrigation development is unclear. While it is possible to enact laws that regulate development and minimize harmful effects on water quality, it is not possible to "mandate" that impacts simply disappear, unless the law redefines what is considered an impact or impairment.

97. **Comment**: Also, in this same paragraph (p. 127, col. 2, para. 2), if the results of the recently initiated arsenic study show that the proposed irrigation projects will violate the ambient arsenic standard and if those projects are already approved by the Board, can those projects still proceed?

Response: Several issues are raised by the comment. First, the recent research by DNRC and BUREC does not "show that the proposed irrigation projects will violate the ambient arsenic standard;" rather, the research suggests that some proposed irrigation projects may not violate the ambient arsenic standard. Projects not in violation of the ambient standard would have the following characteristics:

1) The projects would divert and use water from rivers that contain arsenic (primarily the Madison and Missouri rivers). Projects consuming water from "clean" streams that don't contain arsenic would still violate the ambient standard since they take dilution water out of the basin.

2) The soils irrigated would store arsenic, removing it from the applied water and thereby reducing the arsenic concentration in subsequent return flows and concentrations and loads in downstream surface and groundwater.

3) The soil storage of arsenic would need to be permanent. It is likely that arsenic stored in the soil profile will be subjected to long-term geochemical changes that may remobilize arsenic at some future time. If so, arsenic may be transported to groundwater and surface water at a later date, and ultimately the projects would be in violation of the standard.

The continuing arsenic investigation was designed, in part, to examine the long-term effects of irrigation with arsenic-laden water and the potential for remobilization of arsenic stored in the soil profile (see comment 94).

The second issue concerns DNRC's interpretation and enforcement of the ambient arsenic standard. If a proposed irrigation project will definitely violate the ambient standard, then the project can be developed only if the law is changed or not enforced. As indicated in the contested case hearing on the upper Missouri River basin water reservation proceedings, DHES does not plan to try to change the law and does plan to enforce it.

98. **Comment**: Page 187 of the draft EIS contains the statement: "Reservations for instream flow are the only way to protect streamflow for water quality, fish, and recreation on streams where such reservations are requested."

Page 126, Water Quality - The EIS states: "Reservations for irrigation projects have the greatest potential to adversely affect water quality and increase municipal water treatment cost by:

1) Reducing the volume of water available to transport and dilute chemical constituents in surface water and groundwater.

2) Increasing concentrations of salts, trace-elements, nutrients, and pesticides in shallow groundwater, irrigation return flows, and surface waters.

3) Modifying water temperatures through alteration of the seasonal pattern of streamflow by storage and diversion projects: dewatering of streams in late summer may lead to increased water temperatures and resulting reductions in dissolved oxygen.

Page 127, column 1, paragraph 1 - Existing water quality information retrieved from EPA's

STORNET data base was inadequate to develop a water quality model allowing quantitative description of potential effects of reservations on water quality. Water quality records are sporadic at most locations, measurement stations are sparsely distributed, and information for many possible contaminants is not routinely collected. Consequently, development of a water quality model that would allow systematic comparison of water reservation alternatives was not possible. An alternative approach, screening level analysis, was used instead.

The water quality issue as presented in this EIS is unfounded and biased against agriculture.

Response: The draft EIS presents an objective assessment of potential effects of the proposed water reservations on water quality. The draft EIS also honestly admits the limitations of the analysis presented and the justification for "screening level analysis." To develop a quantitative water quality model would have required extensive data collection over a period of several years and with considerable staff resources devoted to model development. The costs of data collection alone would exceed several hundred thousand dollars. Clearly, this was not an option within the scope of the water reservation proceedings (for comparison, the cost of the continuing arsenic research project in the upper basin is $750,000).

As indicated in the response to comment 93, there is extensive documentation of the potential adverse effects of irrigated agriculture on water quality (Ayers and Westcot 1985; U.S. Salinity Staff 1969; Bauder 1990). This is especially the case in semiarid basins. Water quality concerns are an issue for irrigation development in the lower Missouri River basin. Raising and addressing this concern in the EIS was intended to provide the information necessary for an informed decision. It should not be viewed as a bias against agriculture.

99. **Comment**: In working with streambank erosion on the lower Missouri River for the past five years, Warren Kellogg, an employee of the Soil Conservation Service, stated, "The non-point pollution of streambanks on the Missouri River is the largest polluter of waters in the State of Montana."

Response: The intent of this comment is confusing and the context is unclear. It is a well known fact that streambank erosion on the lower Missouri River presents several significant problems including loss of agricultural land and increases in the fine sediment load of the river. Much of the erosion occurs naturally, but some of the bank erosion may have been enhanced by flow regulation and sediment storage effects of Fort Peck Dam and by agricultural practices such as farming (irrigation) to the edge of the bank and cottonwood clearing.

STREAM CHANNEL FORM

100. **Comment**: A commentor challenged DFWP's flow methodology regarding dammed streams and undammed streams and channel maintenance flows to protect aquatic habitat.

Response: See Appendix C of the draft EIS for a description of the methods used by DFWP in determining its water reservation requests. The Board will have to decide whether DFWP's methods are accurate and suitable.

101. **Comment**: The Missouri River is becoming wider and shallower due to streambank erosion and instream flows would exacerbate the situation.

Response: The effects of Fort Peck Dam on the Missouri River and its streambanks are discussed on pages 54 and 55 of the draft EIS. If granted, instream flow reservations would not affect the existing flow characteristics of the Missouri River, nor would they require the Corps to change its existing operations of Fort Peck Dam.

102. **Comment**: Page 55. The statement regarding the removal of vegetation cleared for agriculture, and that irrigation return flows saturate banks, and causes them to fail, should be more thoroughly justified before such a conclusory statement. It appears that the main factor in channel morphology in the lower basin is the operation of Fort Peck Dam. Justification should be provided for these statements.

Response: Where irrigated land is located immediately adjacent to streams with steep banks, excessive irrigation water can saturate soils near the tops of the streambanks. When stream levels are low, a large seepage gradient between the saturated soils and the river can develop, exerting water pressure against the banks and causing them to fail and crumble into the stream. Because the Missouri River streambanks are steep, there is the potential for this process to occur along the river.

Plant roots help to reinforce streambanks. Clearing and cultivation can destroy root structures, leaving the streambanks more susceptible to erosion. Clearing vegetation at the top of streambanks also can increase surface runoff which can erode the face of banks. The effect of Fort Peck Dam on streambank stability is discussed on pages 54-55 of the draft EIS.

103. **Comment**: Page 140, second paragraph - Contained within this paragraph is the statement that narrower stream channels have less capacity to transport water, and therefore are more likely to cause flooding. The conservation districts would appreciate the basis for this conclusion that narrow stream channels have less water transportation capacity as compared to the recent trend by land management agencies to require "proper functioning riparian areas" which desire narrow, deep stream channels.

Response: The capacity of a channel to transport water is governed by its area (width X depth), gradient, and the roughness of its bed. If depth, gradient, and roughness remain the same but width decreases, the capacity of the channel to convey water will correspondingly decrease. This is the situation DNRC was referring to on page 140--the channel width decreases with no increase in channel depth or change in gradient. A deepening of the stream channel, as may result from riparian management, could offset some of the effects of narrowing on channel capacity.

104. **Comment**: As an active irrigator with floating pumps in the river, I (Larry Tveit) know first hand that these pumps cause little damage to the stream banks, and the DFWP's application stressing all the damage these pumps have on stream banks is only a tactic by the department against agriculture. Many other points in the application mainly address the antiagriculture attitude of DFWP.

Response: DFWP's application does not directly address impacts to streambanks associated with the use of floating pumps. DNRC agrees that when floating pumps are used without bank disturbance, few adverse effects to the stream banks occur. For a discussion of the effects of pumping stations, please see page 137, column 2, of the draft EIS.

The suggestion of any bias on the part of DFWP in the development of its water reservation application should be presented as testimony during the contested case hearing. In developing the final EIS, DNRC addressed comments related to the draft EIS only.

105. **Comment**: Page 164, Recreation - The EIS implies that the Instream Flow Alternative would enhance the recreation activities in the lower Missouri River basin. In actuality, instream flow has been available for recreation all along. The main factor restricting recreational use is degraded water quality caused by the severe streambank erosion. The solution to the erosion problem lies in bank stabilization practices and better controlled Corps releases. Obviously, guaranteeing high levels of instream flow will only accelerate the erosion problem, thereby further decreasing recreational potential.

Response: There is no intent in the draft EIS to imply that instream flow reservations would enhance existing recreational opportunities in the lower Missouri River basin. Instream flow reservations, if granted, would not change existing recreational opportunities.

Existing erosion problems along the lower Missouri River are discussed on pages 54 and 55 of the draft EIS. Granting reservations for instream flows would not alter existing flows and related erosion along the lower Missouri River.

106. **Comment**: The draft EIS did not include an in-depth narrative on the methodology used in deriving requested channel maintenance flows. I (Gerald Goroski) recommend that the final EIS include a more detailed discussion on channel maintenance flows, and the methodology used in estimating dominant discharge. For example, the final EIS should discuss how the spring bankfull streamflows were determined for each drainage and how the time period for each drainage was selected. Further, the draft EIS did not list DFWP's entire channel maintenance flow requests in Chapter Three which is entitled "Description of Reservation Requests." With a title like that, I recommend that DFWP's channel maintenance flow requests be fully disclosed in the final EIS.

Response: DFWP's channel maintenance flow methodologies were briefly discussed on page C-5 of the draft EIS. It was stated that DFWP used the dominant discharge concept to develop its channel maintenance flow requests. This concept assumes that dominant discharges (spring bankfull streamflows) are responsible for shaping and maintaining stream channels. DFWP hired the USGS to estimate the dominant discharge for streams, and to determine the appropriate timing and duration of its channel maintenance flow requests.

USGS assumed that bankfull or "dominant" discharges occur in the spring, about once every 2 years (Parrett 1994). Streamflow data from a gauging station on each stream were used by USGS to determine this 2-year peak flow. This was the peak discharge flow requested by DFWP in its reservation application.

DFWP requested flows that gradually rise up to the peak or dominant discharge and then recede back down, all over a 14- to 21-day period. DFWP's reason for doing so was that it assumed that a gradual rising to and receding of flows from the dominant discharge are necessary to maintain existing channel characteristics. USGS determined the appropriate flow pattern for each stream by examining its streamflow records and finding characteristic flow events that rose to near the dominant discharge and then receded from it. Several such events were compared for each stream. Professional judgment was then applied to provide an estimate of daily flows over a 14- to 21-day duration for the typical 2-year peak flow event.

Channel maintenance flows were requested for the period in the spring when the dominant discharge generally occurred on a stream, as determined by examining streamflow records. The total flow requests (peak flows and stair-stepped flows) are presented for each stream in Appendix B of this final EIS.

107. **Comment**: The problem of severe streambank erosion on the Missouri River and its tributaries is not addressed.

Response: Please see pages 54 through 56 of the draft EIS.

VEGETATION

108. **Comment**: Page 58 - The discussion presented here of the impact of Fort Peck Dam on bottomlands is informative but not directly related to the reservation requests. The point should be made that Fort Peck Dam is the overriding factor in the environment in this area, and consumptive use water reservations will have little or no effect on bottomland conformations.

Response: Chapter Four describes the existing environmental conditions in the area, as required under MEPA. MEPA also requires that an EIS examine the "cumulative" impacts of the proposed action on the existing environments. Cumulative impacts are the combined impacts of the proposed actions and those from past and present development—for example, those due to reservations in combination to those due to Fort Peck Dam. The discussion on page 58 provides the reader with some background on vegetation so the impacts of the various alternatives can be compared to existing conditions, and cumulative impacts determined.

Impacts to plant communities under the various alternatives are discussed in Chapter Seven (pp. 141-145 of the draft EIS). As pointed out, Fort Peck Dam has substantially altered the environment in the lower Missouri basin. This has affected plant communities as discussed on page 58 of the draft EIS. The impacts to plant communities described in Chapter Seven of the draft EIS can be thought of as in addition to or "cumulative" to those discussed under existing conditions in Chapter Four.

109. **Comment**: Page 141, last paragraph - Please define "especially acute" impacts on plant communities under the Consumptive Use Alternative.

Response: "Especially acute" refers to 8,956 acres of bottomland plant communities lost under the Consumptive Use Alternative, and 8,404 acres under the Combination Alternative (Table 6-14, p. 142, of the draft EIS).

110. **Comment**: Pages 143-145 - Wetlands in this draft EIS have been determined with an outdated and invalid set of criteria. The definition of wetlands is different among the U.S. Fish and Wildlife Service, the Army Corps of Engineers, the SCS, and other agencies. We suspect that many of the acres of land identified in this table would not be wetlands under the Corps' definition. Please include an additional discussion on the assumptions and definitions used for the determination of wetlands in the EIS.

Response: A preliminary analysis of wetlands within proposed irrigation projects was conducted with USFWS National Wetland Inventory maps. Wetlands on these maps were classified using the Cowardin System (Cowardin et al. 1979) (pp.

143-146 of the draft EIS). In its wetlands delineation manual, the Corps recommends using National Wetland Inventory maps in the preliminary stages of identifying potential wetlands on proposed project. The SCS also sometimes uses National Wetland Inventory maps in making a preliminary determination of the presence of wetlands at a site. The wetland analyses in this EIS are preliminary. A more thorough analysis of potential wetlands within a project would include field investigations to determine whether wetland vegetation, soils, and hydrology are present.

The Cowardin System of classifying wetlands is not outdated. It is the wetlands classification system most used by the USFWS.

111. **Comment**: Page 144, column 2, third full paragraph - Explain why "proposed reservations further downstream" from the International Marsh Waterfowl Production Area "may reduce the amount of water available for this project."

Response: The water use permit application for the International Marsh Waterfowl Production Area was filed in 1987, making this project junior to the proposed reservations. If granted by the Board, the downstream water reservations for both irrigation and instream flow on the East Fork Poplar and Poplar rivers would be senior to the permit. The term "may" was used because DNRC is not certain whether the downstream reservants would place a call on this upstream junior water right or if USFWS would seek to have the reservations subordinated to the permit.

LAND USE

112. **Comment**: DFWP reservation request will affect (decrease) value of land next to the river.

Response: Any prior water right could limit the availability of water on a given parcel, whether the prior right is for consumptive use or instream use. Reservations could either increase or decrease the value of property, depending on the purchaser's plans for a parcel.

113. **Comment**: Table G-3 in Appendix G needs clarification. BL-181 acreage seems high.

Response: As indicated, the acreage for BL-181 needs some clarification. The project proposes to provide supplemental irrigation to 6,000 presently irrigated acres in the Blaine County area (listed as the 6,000 acres in Appendix G). The project also would involve construction of a reservoir and canals that would cover 577 acres currently used for dryland range and 955 acres used for riparian rangeland. This additional nonirrigated 1,523 acres would be converted to water supply and distribution uses, but would not become cropland. The total project would affect 7,532 acres, of which 6,000 would receive improved water supply for irrigated crop production.

114. **Comment**: Tables in Appendix G such as the data regarding the Valley County project size seem unreasonable. How do we decipher these tables? They should be simplified.

Response: The Valley County existing irrigation acreages are estimated from aerial photographs, Conservation District information and on-site visits. The listed "Project Size" for the Valley County projects includes all affected lands. The existing land uses for project-affected acreages are for irrigation, dryland grain, dryland hay, dryland range or riparian rangeland uses. The acreages listed in these categories should add up to the total "Project Size" listed in the first column. For example, VA-03 would provide irrigation water to 599 acres that currently are used for dryland grains and to 334 acres that currently are in riparian range uses. These two existing types of land use add up to the total 933 acres proposed for new irrigation (the project size).

115. **Comment**: Page G-3 - An explanation of how Table G-1 should be interpreted would be helpful. There also seems to be some confusion in the numbers for Blaine County, particularly BL-181.

Response: Table G-1 shows existing land uses on acreage proposed for irrigation projects. Column 1 lists the conservation districts and their proposed projects. Column 2 lists the number of acres that the proposed projects will irrigate. Columns 3, 4, 5, 6, and 7 specify the existing land use of all affected acreage needed to build the proposed irrigation projects. These existing land uses were determined by aerial photographs, conservation district information, and on-site visits.

The differences between Column 2 and the sum of Columns 3, 4, 5, 6, and 7 is acreage required to build storage projects. BL-131, BL-171, BL-181, and LI-241 are the only storage projects proposed in the lower Missouri River basin and require 50 acres, 67 acres, 1532 acres, and 55 acres, respectively, for water storage and canal development. Also see response to comment 113.

116. **Comment**: The EIS should address the requirement for irrigators to sign leases for diverting water from navigable rivers that are considered state land.

Response: The development of conservation district and municipal water diversions within the navigable high water line would have to go through normal permitting processes for developments on State of Montana lands. The process that the Department of State Lands uses to authorize or restrict such developments is outside the scope of this document.

117. **Comment**: The EIS does not address backlash to recreation attributable to land access limitations (if landowners are not treated right).

Response: While any action by the Board of Natural Resources and Conservation may upset or inconvenience some affected parties, the effects of the actions discussed in the draft EIS would generally have very localized and slight land use effects. Whether other landowners would act in sympathy with affected landowners is speculative and outside the scope of the EIS.

118. **Comment**: Consider range reservation management in eastern Montana. It enhances all uses. EIS should address this proper range management.

Response: No water reservation applications were received for range management purposes. Proper range management techniques and benefits are outside the scope of the water reservation process.

119. **Comment**: On page S-4 under Land Use, I (Dean Harmon) question the acres and percentages. The State Appraiser's Office located in the courthouse in Roosevelt County informed me there are 8,303.82 acres of tillable irrigated land, not held in trust, in the county. On page 13 of the EIS, there are 24,979 acres under the reservation request of the soil conservation district. Instead of a 22 percent increase in newly irrigated cropland, it would be 300 percent. This amounts to a very serious impact on the future tax base of our county.

Response: As shown on Map 4-5 of the draft EIS (Irrigated Land in the Lower Missouri River Basin), approximately 44,600 cropland acres are irrigated (Montana Agricultural Statistics Service 1991; Missouri River Basin Commission 1981; U.S. Burea of Census 1989) in the Lower Missouri subbasin (McCone, Richland, Roosevelt, Daniels and Valley counties). The section entitled "Lower Missouri River Subbasin Land Use", on page 147 of the draft EIS, describes possible irrigation land increases under the three action alternatives. These alternatives propose to irrigate up to 45,698 subbasin acres using reserved water (p. 147), including 24,979 acres in Roosevelt County (p. 13). This includes land both within and outside the Fort Peck Indian Reservation. The socioeconomic effects of these irrigation reservations are described on pages 172 to 174, showing that total property tax receipts in the Lower Missouri Subbasin would be projected to increase by 0.8 percent or $72,321 if all proposed irrigation projects were developed.

120. **Comment**: The map on pages 75 and 76 identifies Waterfowl Production Areas and Wetland Easements. Wetland Easements are individual wetlands that the landowners have granted an easement on, yet if one looks at the map the spatial area represented for these easements involves more land area than the actual wetland. A map that represents the true spatial area of these easements should be used.

Response: Some very early wetland easements were written to include all wetlands within a given property area. Individual wetland locations were not identified in some early wetland easements. Maps provided to DNRC by USFWS did not describe these different wetland locations, but indicate the general areas where wetland easements are in effect. The revised wetlands map of the Sheridan county area included in the final EIS (page 119) contains footnotes to this effect. While wetland easements are for specific wetland areas, the landowner having an easement may not take actions that would destroy wetland functions on easement lands.

FISHERIES

METHODS

121. **Comment**: Page 150, last paragraph - The operation of Fort Peck Dam is the main factor in water depth for spawning in the river below the

dam. The impact of 250-300 cfs of depletion from irrigation will be minimal. The consumptive use decrease in depth should be reported at this stage of the EIS.

Response: DNRC agrees that operation of Fort Peck Dam is a controlling factor in determining flow below the dam. Other controlling factors include precipitation in the drainage, consumptive water uses, and operation of other upstream dams. Reduction in flow of 250-300 cfs might have an effect on sauger spawning habitat, depending on the flow of the river during the sauger spawning period. At flows above about 7,000 cfs, reducing flows by 250-300 cfs would drop water levels by less than an inch. See Appendix C of this final EIS for more detailed discussion.

122. **Comment**: The draft EIS emphasizes streamflow for certain months of the year. Instream flow methodology for habitat protection is questionable (Appendix C of the draft EIS).

Response: In the Upper Missouri River proceeding, the Board found that the WETP, fixed percentage, and channel maintenance flow methods used by DFWP and BLM were accurate and suitable. The Board will have to decide in the Lower Missouri Water Reservation process whether these methods, the base flow approach, and relationships between flow and fish spawning and rearing are accurate and suitable.

123. **Comment**: DFWP has quantified the amount of water needed to sustain aquatic habitat in the upper basin, but its requests in the lower basin seem unreasonable. Could DNRC quantify or show how DFWP quantifies the amount it requests? Needs clarification.

Response: The methods used by DFWP are briefly described in Appendix C of the draft EIS.

124. **Comment**: A study by Trihey and Stalnaker shows that the value of summer instream flow is over inflated. Short-term variations in streamflow can benefit fish habitat. Winter conditions (ice-over) have way more effect on fish populations than summer flow.

Response: DNRC assumes that the statement refers to a paper written by Trihey and Stalnaker in 1985. The authors were describing standard-setting as opposed to hydraulic (such as the Wetted Perimeter Inflection Point) methods of determining instream flows. The direct quote from the referenced paper is: "The problem with basing the well being of fish populations on low-flow statistics is that the long-term effects of artificially maintaining these minimum flows is seldom the same as infrequent, naturally occurring, short-term effects that may appear in the historic record (e.g., three drought years in a row is uncommon). The ability of fish populations to compensate for a 1-in-10 low flow event may give the false impression that the fish population will remain healthy and viable if this minimum flow (drought) condition were imposed year after year. As water projects were built and operated, it became apparent that in many cases the fishery resources were decimated as a result of the planners' and hydrologists' illogically assigned low-flow statistics."

Given the full context of the statement, it is clear that the commentor is incorrect in his assumption, but is correct in noting that fish mortality is generally greater in winter than summer, at least under natural conditions.

Other

125. **Comment**: We (Phillips County Commissioners) feel there should be no reservations on streams that do not have gauged recorded flows.

Response: Your opinion is noted. State law allows the Board to grant reservations on ungauged streams if the criteria discussed in Chapter Seven of the draft EIS are met.

126. **Comment**: Referring to Appendix C, page 4 - Northern pike introduction by DFWP brought about demise of trout in the Missouri River.

Response: It is incorrect to assume that trout were ever native to the lower Missouri River. They were introduced and are present in the reach of the Missouri below Fort Peck Dam as result of the cold water releases from the dam. The commentor is correct in his assertion that northern pike were introduced into the lower Missouri River. However, it is an overstatement to say that trout have met their demise in the lower river, or that pike were the cause.

127. **Comment**: Northern pike in Reaches 1 and 2 in Redwater are not uncommon. Rather, during spring spawning season, there are so many in the lower reach you can catch them with a pitchfork.

Response: Thank you for the information. The source of the information in Appendix H is the Montana Rivers Information System. Information from the DFWP reservation application (DFWP 1991) pertaining to the fishery of the Redwater River is quoted below:

> *The only gamefish species found in Reach #1 is the northern pike. Numbers of northern pike are very low near Circle and increase in a downstream direction from the Highway 254 bridge. The presence of young of the year indicates that northern pike reproduce in this reach of the river. Northern pike numbers in Reach #1 have not been estimated.*
>
> *Estimates of fishing pressure and harvest for this reach are unavailable. Fishing pressure is probably low due to the low human population near the river and the limited recognition of the fishery by residents in more populated areas. The fishery is well recognized by local anglers.*
>
> *Estimates of game fish numbers in Reach #2 are unavailable. The relative abundance of game species is thought to be low. Populations of walleye and northern pike are self sustaining, as evidenced by collections of both adults and young-of-the year.*
>
> *Estimates of fishing pressure and harvest are unavailable for Reach #2. Fishing pressure is probably low due to the low human population near the river and the lack of recognition of the fishery by residents in more populated areas. Local anglers are well acquainted with the fishery.*

128. **Comment**: Referring to pages 21-22 of the draft EIS: With respect to East Fork and Middle Fork of Poplar River, DFWP wants most water for instream flows during April and May. Is this because it is during irrigation periods?

Response: In reference to the East and Middle forks of the Poplar River, DFWP's application states: "The requested flows are necessary to help protect spawning and incubation habitats for gamefish, to maintain the channel form, provide for the annual flushing of bottom sediments, and maintain survival habitat for gamefish during the low flow months. Flows also are necessary to help protect the habitat of the wildlife species that depend upon the river and its riparian zone for food, water and shelter."

129. **Comment**: Instream flow requests are for areas where irrigation practices occur. Seems as though FWP requests are aimed at areas and times where irrigation occurs. Why did FWP pick these months and locations?

Response. DFWP requested reservations for instream flows in streams which support game fish populations. The amount requested was that which DFWP thought necessary to protect spawning and incubation habitats, maintain channel form and flush bottom sediments, and the amount their biologists thought necessary to maintain habitat for game fish. (Also see response to comment 128.)

130. **Comment**: It's not our (Jack Stensland and other irrigators) fault that we have to irrigate when fish are spawning.

Response: Your comment is noted. The draft EIS did not state that any person, group, or species is at "fault" for existing conditions.

131. **Comment**: Where do reservations for instream flow end?

Response: Table 3-2 on pages 21 and 22 of the draft EIS specifies the reaches where instream flow requests have been made. However, reservants, like any water right holders, could require upstream junior water users to release water during periods of low flow to satisfy their rights.

132. **Comment**: Reservations by DFWP on noncontinuous flowing streams would only be detrimental to the ecosystems as they now exist. For example, Black Ranch's reservoir has yielded more fish to fishermen in one day than all of Rock Creek has since its inception.

Response: Your opinion is noted. Instream reservations would not harm the ecosystems that now exist unless flows are being maintained by irrigation that would be junior to the reservation. The reservoir is stocked annually with about 5,000 2- to 4-inch rainbow trout, while fish rely on natural reproduction in the creek. Fishing pressure surveys indicate that both Black Ranch Reservoir (also known as Hose Reservoir) and Rock Creek receive only light fishing use. However, Rock Creek received more use than the reservoir during 1989 and 1991, two years for which reliable data are available.

Table 3-4. Fish stocking records for the period 1982-1993 on streams where instream flow reservations are requested

STREAM	SECTION	SPECIES STOCKED	YEAR	NUMBER STOCKED
Beaver Creek (Hill County)	01	Kokanee	1986	710
		Brown trout	1987	1,518
		Smallmouth bass	1989	5,000
		Rainbow trout	1991	unknown
		Smallmouth bass	1991	5,000
	02	Brown trout	1983	1,000
		Cutthroat	1984	400
		Brown trout	1986	2,508
		Brown trout	1987	1,518
	04	Rainbow trout	1982	1,606
Clear Creek		Brown trout	1990	1,518
		Brown trout	1991	1,998
Battle Creek		Smallmouth bass	1983	11,715
Peoples Creek		Rainbow trout	1987	750
Beaver Creek (Wibaux/Fallon Counties)		Largemouth bass	1990	10,000
		Largemouth bass	1991	10,000
		Smallmouth bass	1991	3,000
Missouri River and Fort Peck Reservoir (Valley County)		Chinook salmon	1983	49,600
		Chinook salmon	1984	49,280
		Chinook salmon	1984	63,600
		Chinook salmon	1984	68,054
		Chinook salmon	1984	35,700
		Chinook salmon	1985	37,760
		Yellow perch	1985	15,000
		Chinook salmon	1985	28,320
		Chinook salmon	1985	5,050
		Chinook salmon	1985	17,820
		Chinook salmon	1985	15,840
		Chinook salmon	1986	40,200
		Chinook salmon	1986	37,200
		Chinook salmon	1986	16,320
		Walleye	1986	1,513
		Brown trout	1988	32,558
		Brown trout	1989	5,557
		Brown trout	1990	5,124
		Walleye	1992	10,000
		Walleye	1993	10,000

SOURCE: DFWP 1994

Hose Reservoir:	79 angler days in 1989
	39 angler days in 1991
Rock Creek:	714 angler days in 1989
	332 angler days in 1991

DNRC has no access to records of catch rates for Rock Creek or the reservoir that date back to the inception of the creek to validate your assessment.

133. **Comment**: Page 149, paragraph 5, last sentence - The purpose of the sentence is unclear. Additional consumptive water uses could reduce stream flows that protect aquatic habitat. However, the only way to maintain streamflows that will protect aquatic habitat would be to have an instream reservation approval. The concept needs clarification.

Response: The beginning of the referenced paragraph describes the consequences of severely reduced flows. The purpose of the last sentence in the paragraph is to point out that if only minor reductions in flow occur, the resulting impacts could be much smaller than described. For example, if small reductions in flow occur while a stream is flowing well above the high inflection point, minimal short term impacts to aquatic habitat would be expected.

134. **Comment**: There is no mention of agriculture's attempt to maintain dams for the production and raising of fish. DFWP efforts to restock streams and reservoirs for recreation as in Fort Peck Reservoir and other tributaries also are not mentioned.

Response: The EIS focused on the environment that would be affected by the proposed reservations and, as a consequence, did not attempt to describe the fisheries resource in each stock or farm pond throughout the Milk, Lower Missouri, or Little Missouri River subbasins or the Sheridan County Groundwater Area. Many ponds and small reservoirs are stocked with fish by individuals or with assistance from DFWP and provide recreational fishing opportunities.

Table 3-4 shows stocking records on streams where instream reservations are requested.

THREATENED AND ENDANGERED FISH

135. **Comment**: Page S-4, last paragraph - Additional irrigation releases from Fort Peck Reservoir might improve the habitat of the pallid sturgeon due to better timing and condition of streamflows. It would seem that the operation of Fort Peck Dam is the overriding consideration and the effects of consumptive water use reservations is extremely minor.

Response: The Army Corps of Engineers is not required to make releases from Fort Peck Reservoir to satisfy the needs of junior irrigators or other junior water users. However, the commentor is correct in pointing out that operations of Fort Peck Dam are an important determinant of flows in the Missouri River below the dam. The changes in flow in the river below the dam due to water reservations are shown in Table 6-19 of the draft EIS.

136. **Comment**: The assertion that pallid sturgeon are affected by irrigation is wrong. They are affected by Corps' releases from Fort Peck Dam.

Pallid sturgeon habitat is more affected by Corps' operation of the dam than by irrigation.

Response: The commentor is correct in suggesting that operation of the main-stem dams has altered the pattern of flow in the Missouri River and has had major effects on habitat of the pallid sturgeon. Additional irrigation diversion would further alter the flow pattern of the river and add an increment of impact to those caused by reservoir operations. The magnitude of the change in flow due to irrigation under the various alternatives is shown in Table 6-19 of the draft EIS.

Irrigation could kill young pallid sturgeon when they are entrained in pumps used for diversion of water. To reduce the chances of this occurring, USFWS has recommended locating pumps in deep water or screening the intakes.

137. **Comment**: DFWP is interested in only two species on the lower Missouri—pallid sturgeon and paddlefish—and the methods used to determine habitat needs for these species were developed for trout and do not apply on the lower Missouri.

Response: DFWP's application for instream flow is intended to protect the habitat of many species inhabiting the lower Missouri River, not just paddlefish and pallid sturgeon. For example, DFWP applied to reserve water to protect riffle habitat and sauger spawning habitat on Reach #8 of the Missouri River. Protecting riffle habitat will help ensure that habitat would be protected in pools as well as riffles. All species inhabiting these areas, from invertebrates providing food for fish to top level predators in the food chain, would benefit from this protection. The Board will have to determine whether the methods DFWP used are accurate and suitable for this proceeding.

138. **Comment**: Look at the Corps' current operating procedures which are detrimental to aquatic habitat and irrigation.

Response: See discussion on page 68 of the draft EIS.

WILDLIFE

THREATENED AND ENDANGERED SPECIES

139. **Comment**: With respect to threatened and endangered species, no one knows better than the landowners about what is going on.

Response: Landowners indeed often have considerable knowledge regarding locally occurring threatened and endangered species. DNRC used the best available published data and information. For analyses of threatened and endangered species, DNRC used data from the U.S. Fish and Wildlife Service. The USFWS is the federal agency responsible for addressing the issue of threatened and endangered species and therefore offers the most up-to-date and complete data and information on the subject.

140. **Comment**: Flow needs for the piping plover and least tern contradict DFWP requests for flows.

Response: During the spring when least terns and piping plovers may be nesting along the lower Missouri River, DFWP has requested the following amounts:

Reach	Flow (cfs)	Instream flow when 50 percent limit is applied
Missouri River Reach #7		
April 10 - May 10	7,800	April - 5,341 May - 7,255
May 11 - June 30	11,000	June - 8,159
Missouri River Reach #8		
May 11 - June 30	11,500	May - 7,926 June - 9,278

In its recommendation to the Corps regarding releases from Fort Peck Dam, the Missouri River Natural Resources Committee (1993) recommended that in 1994 flows of 12,000 cfs be released to scour vegetation from islands. After June 15, releases were to decrease to 8,000 cfs to provide sediment deposition and reveal nesting habitat on islands and sandbars.

DFWP's request would conflict with least tern and piping plover nesting. Since the Board cannot grant reservations for more than one-half the average annual flow of record on gauged streams, DNRC reduced the request as indicated above and in revisions to Appendix J (see Changes to the Draft EIS). These reduced amounts could conflict with nesting in late June.

141. **Comment**: The Endangered Species Act has a finite life; its continued existence depends on public support and may become a significantly different law in the future. Some consideration of this should be included in the final EIS.

Response: The Endangered Species Act is up for reauthorization by Congress. Several changes to the Act have been proposed, but the outcome of these proposals is uncertain. The Act itself will remain in effect unless expressly repealed by Congress. If Congress changes the Act, municipal and irrigation projects built at a later date would have to comply with rules in effect at that time.

142. **Comment**: Who performs threatened/endangered species studies? Such studies seem biased to FWP interests, and should be more balanced.

Response: Studies of threatened and endangered species are conducted by a variety of state and federal agencies, universities, and private consultants. Under the Endangered Species Act, any federal agency required to issue a permit before a project can proceed must confer with the U.S. Fish and Wildlife Service (USFWS) before the permit is issued. If there are questions regarding how a federal action would affect a listed species, then additional studies may be required by the USFWS. DFWP is charged with managing fish and wildlife species in Montana.

143. **Comment**: The EIS addressed the occurrences of the federally listed least tern and piping plover under "Affected Environment," but failed to mention them under impacts. This seems like a

gross oversight. For both of these species, destruction of habitat (taking) is considered a crime under the federal Endangered Species Act, yet there is no mention of how allocation of water is likely to affect either species. I (Peter Lesica) assume that the Instream Alternative will have the least negative impact on these rare birds.

Response: See page 158, column 2, paragraph 2, and Table 6-25 of the draft EIS for this discussion. You are correct that the Instream Alternative would have the least impact due to direct disturbance. Because the Board is limited to granting DFWP no more than 50 percent of the average annual flow on gauged streams, it is unlikely that DFWP's requested reservations would conflict with nesting of these two birds.

OTHER

144. **Comment**: The EIS represents an attempt to describe conditions in eastern Montana by people who know very little about our environment, our economic livelihood, and have tried to understand our wildlife but have failed to consider the importance of agricultural producers' attempts to protect and enhance our wildlife.

Response: DNRC believes it made a reasonable effort to describe the affected environment and impacts of the proposed water reservations. Additional information and analyses to support a particular project may be presented during the contested case hearing.

145. **Comment**: The conclusion on page S-5 under Wildlife regarding the nonquantification of impacts to threatened and endangered species along the lower Missouri River and in the Sheridan County Groundwater Area is problematic at best.

Response: Under the Coordinated Groundwater Development Alternative in the Sheridan County Groundwater Area, an interdisciplinary group would manage the reservations in such a way as to prevent noticeable changes in water levels and adverse effects to waterfowl habitat. In the lower Missouri, the Board could require additional studies before reservations are used for consumptive purposes, and could make development of such reservations dependent upon a finding of no adverse effect to threatened or endangered species.

146. **Comment**: Regarding the statement in the summary that farming operations could disturb nesting raptors, farming operations would insignificantly change the nesting of birds. Very little land would be broken up for irrigation.

Response: Of the 105,394 acres of land where reservations are requested for consumptive uses outside the Sheridan County Groundwater Area, about 14,768 acres are not currently cultivated (pp. 141-143 of the draft EIS). Along the lower Missouri River, about 2 percent of the woodland habitat would be lost to new irrigation under the Consumptive Use Alternative, while the amount of scrub/shrub habitat would decrease by about 1 percent. Birds, especially songbirds, use this habitat for nesting. See page 157 of the draft EIS, last paragraph, for more detail pertaining to effects on nesting raptors.

147. **Comment**: There is no explanation of the basis of 4,100 acres of 4,800 acres on page S-5, paragraph 3. In order for farmers to break new land, SCS approval is needed; thereby placing a buffer between uncontrolled breaking and appropriate soil conservation practices. This section does not address additional wildlife habitat created by irrigation or the planting of trees by farmers and ranchers to supplement or replace old growth cottonwoods. My (Dean Harmon) personal experience indicates a net positive environment for wildlife when irrigation is developed.

Response: See pages 141-143 of the draft EIS for more information. Appendix F shows the project locations in relation to existing vegetation patterns along the lower Missouri River. Landowners who do not receive any payments from the federal government would not be required to obtain approval from SCS. However, landowners who receive federal payments or subsidies (wool or crop subsidy, hail insurance, a farm home loan, or SCS project cost share) would require SCS approval before breaking ground for any new projects. This approval would be in addition to the Board's approval of the reservation.

Reservations would not preclude farmers or ranchers from planting trees to replace cottonwoods lost to new cultivation, and reforestation would help mitigate this impact. Tree planting was not proposed by the conservation districts as a method to reduce impacts.

148. **Comment**: Page 157. Grouse courtship is not fully understood. It is not necessarily dependent on CRP land/undisturbed areas.

Response: While DNRC is most familiar with grouse leks in relatively undisturbed prairie settings, we are aware of leks reported in stubble fields, rock piles adjacent to fields, and even on infrequently used county roads. The main point is stated in the last sentence in the paragraph. If grouse leks are greatly altered during the spring mating season by breaking of new ground in or around a lek or other human activity increases, then courtship could be disrupted. Also, if most nesting cover is destroyed in a large area by cultivation, then grouse numbers could decrease.

149. **Comment**: Referring to the list of mitigating measures on page 185, replace "regulate livestock grazing" with "monitor livestock grazing." Explain who would be responsible for fencing haystacks and using nonlethal means. These impacts and measures to reduce these impacts seem pretty ludicrous.

Response: This section of the draft EIS deals with measures the Board could require of applicants to reduce or eliminate impacts of the proposed reservations. Monitoring livestock grazing would not reduce or eliminate any shortage of forage for wildlife. Also see response to comment 282.

150. **Comment**: It seems as though there are a lot of golden eagles around and I (Lee Matejovsky) believe that it is misdesignated as endangered.

Response: Golden eagles are not listed by USFWS as an endangered species.

151. **Comment**: Instream flows would prevent the construction of dams and development of new irrigated land that would benefit wildlife (ducks, waterfowl, etc.).

Response: Irrigated land can increase the numbers and types of wildlife such as pheasant, hungarian partridge, small mammals, and deer. However, converting land to irrigation decreases other species such as sage grouse, sharptailed grouse, prairie dogs, burrowing owls, and some songbirds which depend on habitat associated with native plant communities.

The change from native grass to crops is not necessarily harmful to all wildlife. As stated in the draft EIS, irrigated cropland may attract deer and antelope, often requiring that they be frightened away or, where such measures are not effective, special hunting seasons may be necessary to remove unwanted animals.

It is not known how much additional irrigation, if any, would result without the proposed reservations for instream flow, where this land would be located, or what crops would be raised. Consequently, it is not possible to say how specific populations of wildlife would benefit from or be adversely affected by additional irrigation.

It is true that small dams often benefit some types of wildlife, and that reserved instream flows might prevent future construction of some such dams in certain cases. However, instream flows and the riparian areas that would be inundated by any dam also have value to wildlife. Without full analysis of specific conditions, it is not possible to determine whether a particular dam would provide net benefits to wildlife.

152. **Comment**: Referring to page 157 of the draft EIS, Blaine County Conservation District concurs that the conversion of native rangeland to irrigated cropland does not reduce forage available to deer. It is a fact in this area that much of the damage to hay is done by the wildlife.

Response: Comment noted.

153. **Comment**: Pages 73-74, Wildlife discussion - The draft EIS should expand its analysis on impacts to wildlife and related habitats to include the beneficial aspects of irrigated agriculture on wildlife populations. Particularly, wildlife populations such as whitetail deer have benefitted from irrigated agriculture as is evidenced by studies conducted by Gary Dusek and others. Throughout the draft EIS, the analysis concerns only perceived negative impacts of irrigation development on wildlife habitats, when in fact much of the evidence by experts in the field suggests that irrigated agriculture has improved wildlife habitats for many species. This analysis and documentation of these issues should be conducted.

Response: Dusek et al. (1989) reported that use of riparian vegetation by bison and other native ungulates, fire, and soil moisture limitations resulted in an open, sparsely vegetated riparian habitat before the lower Yellowstone valley was settled by cattlemen. Removal of bison and suppression of range fires, coupled with development of irrigation and associated increases in soil moisture, may have resulted in the more dense understory seen in today's riparian communities. These changes might have resulted in habitats more suitable to white tailed deer than were once present. This more suitable habitat, along with predator control and restricted hunting during the 1950s, is thought to have led to the increase in numbers of white tailed deer.

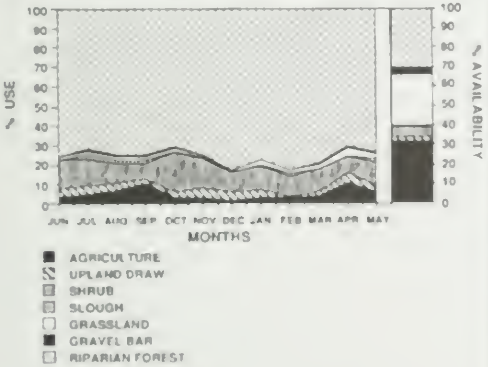
Compton, Mackie, and Dusek (1988) evaluated factors that determined the distribution of white-tailed deer (*Odocileus virginianus*) along the lower Yellowstone River. Deer distribution was determined from five aerial surveys during 1985. Habitat attributes for 28 1.6 km long sections of river bottom were examined to determine which most influenced white-tailed deer density. Habitat attributes evaluated included: riparian forest; shrubland; riparian cover; island area; total grazed area; grazed riparian cover; ungrazed riparian cover; total cropland; grain fields; alfalfa fields; and irrigated crop fields. Riparian cover was the most important factor in explaining deer density distribution, explaining 70 percent of the overall variation. Presence of cattle was the second most important influence on white-tailed deer density distribution. Deer were observed less frequently in areas where cattle did not occur. The amount of island area was the third most important factor, with deer favoring these areas. The importance of cropland, grain fields, alfalfa, and irrigated croplands were not reported but were less important than the other three factors.

Dusek et al. (1989) in a longer term study of white tailed deer population characteristics and habitat relationships along the lower Yellowstone River indicated that riparian forests and shrublands were the most important cover types used by radio collared deer during the day (Figure 3-1). During nighttime, deer increased their use of agricultural land. During the summer, 27 percent of the radio-collared deer observed (relocated) at night were in agricultural fields; this increased to 64 percent during the winter.

Figure 3-2 from Dusek et al. (1989) shows the relative use of different types of forage by different age classes and sexes of white tailed deer along the lower Yellowstone River. Overall browse and agricultural crops composed most of the diet, with browse making up 42 percent of the volume of the rumens examined and agricultural crops 41 percent. Deer numbers were not limited by a lack of browse during the winter. Availability of crops to supplement native forage allowed does to maintain their condition during winter and late spring, and survival rates of fawns were good. The draft EIS has been changed to reflect this information (see Changes to the Draft EIS).

During the time the Dusek et al. (1989) study was conducted, hunting was used to reduce white tailed deer herd size (see page 157 of the draft EIS). Hunting of does was allowed with multiple permits available for each hunter.

Figure 3-1. Diurnal Use (%) of Cover Types Determined From Point Locations of Radio-Collared White-Tailed Deer Systematically Obtained From Arial Surveys, 1980-1986.



SOURCE Dusek et al. (1989)
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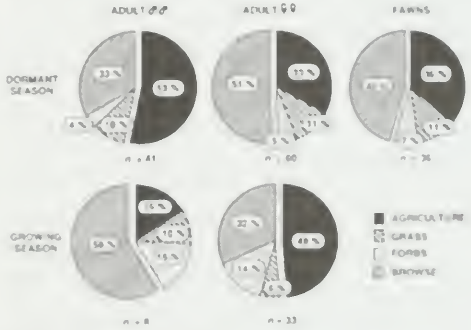
Figure 3-2. Use of Forage Classes by Fawn, Adult Male and Adult Female White-Tailed Deer on the Lower Yellowstone During Periods of Vegetative Growth and Dormancy, 1980-1986.



SOURCE Dusek et al. (1989)
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154. **Comment**: If irrigation rights are lost, environmental impacts would be experienced (i.e., forage for wildlife, trees). Could the final EIS include environmental benefits of present and future irrigation practices?

Response: Reservations would not affect irrigation rights with priority dates before July 1, 1985. Further, because of the subordination process (p. 123, col. 1, of the draft EIS), it is not a foregone conclusion that rights with later priority dates would be adversely affected by reservations. See response to comment 151 for a discussion of how irrigation reservations could change wildlife habitat to benefit some wildlife species and harm others.

155. **Comment**: Farmers and ranchers in eastern Montana are developing windbreaks and shelter belts which benefit wildlife and runoff.

Response: The proposed reservations would not substantially affect the ability of a farmer or rancher to plant windbreaks that would benefit wildlife. Some of the proposed reservations for irrigation projects would remove existing windbreaks.

HISTORICAL/ ARCHAEOLOGICAL

156. **Comment**: It is a threat to private property rights to tie in approval or disapproval of a reservation based on speculation that an archaeological or paleontological site might occur on private land. How will the Board weigh such considerations?

Response: The purpose of the draft EIS is to provide a record concerning potential impacts that various reservation alternatives might have on Montana's resources, including archaeological, historical, and paleontological sites. The possibility of such impacts was not a consideration in determining which reservations would be included in the various alternatives. DNRC did identify measures that could reduce impacts if the Board chooses to adopt them (p. 184, Table 6-43, of the draft EIS). Even without these measures, development of a reservation including state or federal land or crossing such land with an electric line or pipeline may trigger a required inventory and protection of cultural resources under existing state or federal laws (see responses to comments 157, 158, 159).

157. **Comment**: We (State Historic Preservation Office) agree that additional study would be required to determine the significance of many of the known and the yet unknown historic properties in several extensive areas of potential effect. Native American consultation will be necessary to identify and assess the many sites of potential tribal significance. SHPO urges early and meaningful communication with each of the cultural committees representing the several reservations involved. Many areas along the Missouri have a moderate potential to contain human burial, and careful consideration of this potential is called for (Montana Human Remains Protection Act 1992 for state and private land, Native American Graves Protection Act (NAGPRA) for federal land).

Response: During preparation of the draft EIS, DNRC invited comment from representatives of Montana's Indian tribes, using the March 1993 list of cultural committee contacts supplied by SHPO. The nature of this request was to seek information about the sensitivity of areas proposed for reservation development. In response, DNRC received one reply regarding the lower Missouri. In the draft EIS, DNRC recognized the significance of burial sites and features and that such sites may be present along portions of the lower Missouri. Protection requirements for cultural resources on private land are limited under existing law. One notable exception is the Montana Human Skeletal Remains and Burial Site Protection Act (§ 22-3-801, et seq., MCA) This law requires protection of known burial sites, and upon discovery of new sites by agricultural and other ground-disturbing activities, it requires the reporting of discovered burial sites, a field review, and identification of measures to protect such sites in-place, or other treatment under the supervision of the burial preservation board. The requirements of this law would apply to individual landowners developing water reservation projects that disturb burial sites, besides other conditions the Board of Natural Resources and Conservation might adopt for the reservation. Unless conditions are placed on the reservations by the Board or by another agency approving some aspect of project development, protection for archaeological or historical sites other than burials on private land would occur at the discretion of the individual landowner (see response to comment 158). This point has been clarified (see Changes to the Draft EIS).

158. **Comment**: It is possible that consideration of potential effects of any action permitted by land management agencies could be extended to private land under the Historic Preservation Act (1966) as amended (1992).

Response: The draft EIS notes this possibility for projects which include federal land within project boundaries or require crossing of federal land (or land held in trust by a federal agency for a tribe) by pipelines or electric lines to reach project areas. State-owned land affected by a reservation project also may require some review under the Montana Antiquities Act. Board of Natural Resource and Conservation approval of the reservations would not eliminate the obligation of state or federal agencies or the landowner developing the reservation to comply with these laws.

159. **Comment**: We (SHPO) do not agree that additional inventory is warranted only on previously undisturbed land, for the project potentially will have cumulative effects to historic properties as a result of diverse impacts such as increased vandalism and erosion in draw down zones, increased agricultural intensity, and construction of irrigation, transmission lines, pipelines, wells, and diversion structures. Until an adequate inventory is completed, it is not possible to make determinations of significance or assess effect, particularly where cultural and historic landscapes are involved. Thus, we cannot at this time concur with the draft EIS statement that: "No known significant sites would be irreversibly committed as a result of the reservations" (p. 186).

Response: The comment suggests that the measures proposed to reduce impacts to historical and archaeological sites are not adequate because inventory of resources on affected land would not be complete without survey of cultivated land. Inventory and survey of private land are not required by existing law except in those instances where state or federal approval would extend to private land (see response to comment 158). Other requirements would apply where a burial site is discovered (see comment and response 157). On private land where no inventory is required, reservation development might contribute to impacts on a cultural site.

Sites on cultivated land are seldom likely to contain intact cultural deposits. For the draft EIS, DNRC therefore concluded that such land did not merit cultural resource inventory. DNRC recognizes that survey of land and consideration of site location in project design and development can reduce impacts to historical and archeological resources. However, complete inventory of cultivated private land proposed for future irrigation development still does not appear to be warranted based on uncertainty over the presence of sites. DNRC agrees that some rewording of the proposed mitigation measures to include possible case-by-case survey on cultivated land may be warranted where landscape character suggests a high probability of significant site discovery or high site density. These changes have been added to the measures found in Table 6-43 (see Changes to the Draft EIS).

The Board must decide through the hearing process whether to adopt these proposed mitigating measures. Any survey of private land may be seen by some landowners as an unwanted governmental intrusion or burden (see comment 156). SHPO may wish to consider participation in the hearing process to express its views on these measures.

The information available to DNRC for the EIS process suggests that granting reservations will not affect any sites listed on the National Register of Historic Places, or any sites deemed eligible for listing. This is the basis for the conclusion cited on page 186 of the draft EIS.

RECREATION

160. **Comment**: On page 165, column 2, last paragraph - The first sentence states that "Fishing conditions typical of the prairie streams in this subbasin during most summers ... would occur with greater frequency under the Consumptive Use and Combination alternatives...." The sentence doesn't state what is meant by fishing conditions or what would happen to them under these two alternatives.

Response: The paragraph refers to fishing conditions that limit fish distribution to deeper pools separated by stream reaches with little or no flowing water. These conditions could occur sooner during the summer and with greater frequency under the Consumptive Use and Combination alternatives on the Little Missouri River and Boxelder and Little Beaver creeks.

161. **Comment**: Recreation on the lower Missouri River is limited by lack of public access sites and public land adjacent to the river, a fierce mosquito problem, frigid weather; degraded water quality; high sediment loads caused by eroding streambanks, and treacherous floating conditions.

Response: The draft EIS acknowledges that access on the Missouri River below Fort Peck Dam is limited (p. 164, para. 3) and that recreation use levels decline below Wolf Point (p. 81, para. 1). Public access with developed boat ramps is currently available at the downstream recreation area below Fort Peck Dam and at the State Highway 13 bridge near Wolf Point. State-owned land and federal land (BLM) along the Missouri River below Fort Peck Dam is available for public access for hunting and fishing. A permit is necessary for public use of state land. Most land along the lower Missouri River is either privately owned or under Tribal control. Possible effects of the water reservation process on land available for public recreation is beyond the scope of this EIS.

DNRC acknowledges that boating conditions can be dangerous on the lower Missouri River. As on many Montana rivers, mosquitos can make recreation on the lower Missouri River uncomfortable at times and cold weather and muddy water can detract from the recreational experience. The effect of requested reservations on these conditions would be negligible.

162. **Comment**: Page 83, Table 4-21, Sheridan County Groundwater Area angler use, lists Capneys Lake. Although this is the name that appears on USGS maps, the correct name is Gaffney Lake.

Response: Comment noted. No angler use was reported for Gaffney Lake in 1989 or 1991.

163. **Comment**: In eastern Montana I know of very little recreation on tributaries of the Missouri River other than the Milk River and dams of that river.

Response: Tables 4-18 and 4-19 in the draft EIS (pp. 81 and 82) show angler use in the lower Missouri River subbasin is concentrated on the Missouri and Milk rivers and major reservoirs.

164. **Comment**: Water-based recreation is not a high priority in this area. We (Blaine County Conservation District) feel that in the lower Missouri River basin, irrigation development should be the number one priority. Most of the streams in this area are not high quality fisheries.

Response: DNRC concurs that most of the streams with requested instream reservations in Blaine County do not have high value fisheries. See Table H-1 of the draft EIS.

165. **Comment**: An interesting side note is this: MDFWP was offered but declined to accept maintenance and regulation of Lewis and Clark Park Missouri River Access near Wolf Point. If MDFWP wishes to promote recreation on the lower Missouri River, this project would have provided a good opportunity.

Response: The acquisition and development of recreation sites by any federal or state agency along the lower Missouri River is beyond the scope of this EIS.

166. **Comment**: Page 20 - Regarding DFWP's reservation request, the draft EIS should include a statement that angling and other recreational opportunities do not exist in all stretches.

Response: DNRC agrees that fishing opportunities do not exist on all stretches of all streams in the lower Missouri River basin, especially in the Little Missouri River subbasin. The discussion on page 20 of the draft EIS merely summarizes DFWP's reservation request, as presented in that agency's application and in no way implies that all stretches of all streams are open to fishing use. See pages 81-83 and Table 4-18 through 4-21 of the draft EIS for subbasin-specific discussions of angler use of streams.

ECONOMIC AND SOCIOECONOMIC CONCERNS

167. **Comment**: Present ag sales of $156,000,000 as listed on Table 4-23, page 88, seem much too low - more like $700,000,000.

Response: Agriculture sales data (average 1989-91) related to livestock and crop sales in the lower Missouri subbasin as reported by the Bureau of Economic Analysis for Daniels, Richland, Roosevelt, Valley, and McCone counties were:

	Average 1989-91		
County	Livestock sales	Crop sales	Total
Richland	$ 26,223,000	$ 34,421,000	$ 60,644,000
Valley	19,622,000	18,527,000	38,149,000
McCone	9,155,000	9,034,000	18,189,000
Roosevelt	6,926,000	15,933,000	22,859,000
Daniels	4,973,000	11,237,000	16,210,000
Total	$ 66,899,000	$ 89,152,000	156,051,000
State of Montana	$1,035,496,000	$728,336,000	$1,736,832,000

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, Unpublished computerized data. Washington, D.C. 1993.

168. **Comment**: Contrary to the draft EIS, local contractors within 100 miles could construct any of the irrigation projects without any influx of people (workers).

Response. There probably are local contractors that could construct any of the larger irrigation projects described (the largest would be the Roosevelt County CBI-13 developing 9,175 irrigated acres). The draft EIS (p. 176) explains that little additional employment would result from project construction, but that specific construction projects could (not necessarily would) cause some worker immigration (particularly if an out-of-area contractor were used).

169. **Comment**: The portion of the economy directly attributable to agriculture is too limiting. Agriculture also generates indirect income and jobs.

Response. The percent composition figures reflect the direct importance of agriculture and agriculture services to the total economies of the lower Missouri basin. Service and retail trade industries are no doubt also supported by the agriculture sector, but the exact contribution is difficult to assess. This is especially true when considering secondary jobs created by new employment in the agriculture sector. For example, new irrigation service jobs may be created, but they may or may not be created in the lower Missouri basin. Similarly, other service and retail trade jobs may be created by the new agriculture employment due to the proposed irrigation projects, but these new jobs may or may not be created within the lower Missouri basin. See response 172 for historic trends in agricultural earnings.

170. **Comment**: The economic effects and the jobs created by additional irrigation would be significant, and result in a major impact to local counties.

Response: Socioeconomic analysis generally considers an effect of less than about 3 percent as minor, 3-6 percent as moderate, and greater than 6 percent as major or significant. Most increase and employment effects of the additional irrigation are well below 3 percent. See draft EIS Tables 6-36 through 6-40 (pages 172 through 174) for actual estimates.

171. **Comment**: Taxable valuations will increase, incomes will be improved, and jobs in both agriculture and the related service industries will improve. Our local economy is agriculture dependant and even a slight increase in this sector will have a tremendous effect on present and future viability on the communities economy. Why was no multiplier factor used when looking at improved economies?

Response: DNRC evaluated only the initial socioeconomic impacts of developing the proposed irrigation projects. DNRC acknowledges that there may be secondary impacts to the local economies if the proposed reservations are developed, but DNRC also acknowledges that these secondary impacts will exist only in particular circumstances and will then involve both secondary benefits and costs to society.

The conservation districts' applications state that the miscellaneous crops multipliers found in Brester et al. (1986) represent the possible levels of secondary impacts from developing the proposed irrigation projects. These multipliers were estimated using a regional input-output model. A few of the crop multipliers found in Brester et al. (1986) are as follows:

TYPE OF MULTIPLIER	Sugar crops	Feed grains	Miscellaneous crops
Income multiplier	1.95	2.18	1.84
Employment multiplier	1.76	1.85	1.41
Output multiplier	1.70	1.83	1.56
Value-added multiplier	2.56	2.76	2.55

Using the feed grain ratio of 1.85 as an employment impact, between 13 and 133 new secondary jobs might be created in the lower Missouri basin if all the additional irrigation projects are developed. It is unlikely that all projects would be developed. Total employment in 1991 in the service and retail trade industrial sectors, which are only a portion of the nonagricultural jobs in the basin, was approximately 14,000 jobs. Thus, maximum project impact would most likely be less than 1 percent on secondary employment in the basin.

However, Brester gave several cautionary notes throughout his paper. One such note stated the following about the use of these regional multipliers

A change in the output of any one sector causes additional changes in the output of other sectors as the former purchases inputs that are produced by the latter. An impact multiplier measures this total change in the output of an economy. However, implicit to impact multipliers is the assumption that increases in the output of a single sector will cause the real output of other sectors to increase rather than that output being reallocated from one region to another. This is especially important for regional input-output models since, in many cases, an increase in the demand for a commodity by one sector within a region can be easily met by other sectors reducing their exports from the region. Therefore, there is no change in the real output of subsequent sectors in the regional economy. When this occurs, the impact multipliers will overestimate the true regional impacts.

Further, the multiplier effects to local economies would be much smaller than those estimated by Brester et al. However, even if the socioeconomic increases in Tables 6-36 through 6-38 took into account Brester's multipliers, the percent increase over the 1989-1991 averages would still be relatively minor (generally less than 0.5 percent).

172. **Comment**: The socioeconomic analysis work on pages 84-85 is interesting in general terms, but a specific investigation and analysis of how much the service and finance economy in the lower basin directly relates to agricultural activity should be conducted. Furthermore, how much of the service and finance economy is indirectly related to agriculture activity? The importance of agriculture in the area should go beyond merely

Table 3-5. Lower Missouri counties DEPENDENT on a particular economic sector (dependent counties have more than 20 percent of total personal income from the listed sector in years 1988 to 1991)

Economic Sector	Lower Missouri Subbasin	Milk River Subbasin	Little Missouri Subbasin	Sheridan County Groundwater Area	Total Lower Missouri Basin
AGRICULTURE	McCone (22%)	Liberty (32%)	Carter (31%)		
SERVICES, FINANCE, DIVIDENDS, and OTHER	Daniels (57%) McCone (47%) Richland (48%) Roosevelt (57%) Valley (57%)	Blaine (57%) Hill (54%) Liberty (46%) Phillips (58%)	Carter (51%) Fallon (41%) Wibaux (64%)	Sheridan (58%)	Total Basin (54%)

SOURCE: U.S. Bureau of Economic Analysis, U.S. Department of Commerce 1993

Table 3-6. Key economic sectors in lower Missouri counties (counties that have 10 to 20 percent of total personal income from the listed sector in years 1988 to 1991)

Economic Sector	Lower Missouri Subbasin	Milk River Subbasin	Little Missouri Subbasin	Sheridan County Groundwater Area	Total Lower Missouri Basin
AGRICULTURE	Daniels (17%)	Blaine (14%)	Fallon (19%)	Sheridan (14%)	Total basin (13%)
CONSTRUCTION and TRANSPORTATION	McCone (12%) Richland (10%) Valley (11%)	Hill (14%)	Fallon (19%)		
WHOLESALE and RETAIL TRADE	Roosevelt (11%)	Hill (11%)			
GOVERNMENT (including schools)	Daniels (11%) McCone (10%) Roosevelt (17%) Valley (13%)	Blaine (17%) Hill (14%) Liberty (11%) Phillips (12%)	Fallon (13%) Wibaux (11%)	Sheridan (11%)	Total basin (13%)

SOURCE: U.S. Bureau of Economic Analysis, U.S. Department of Commerce 1993 analyzing farm employment and earnings, and analyze the economic activity generated by agriculture in the area. The analysis to date is somewhat limited.

Response: Any discussion of economic dependence and multipliers is fairly academic. Three of the 13 counties in the lower Missouri basin meet the economic definition of dependency on agriculture (Table 3-5). While the agricultural sector makes a valuable contribution to the personal income of these counties, other larger sectors, such as services, government transfers, tribal support, and retirement income also are important.

A detailed analysis of the lower Missouri basin economy, its economic linkages, and possible agricultural-generated activity is beyond the scope of the reservation process. The following analysis of the major lower Missouri basin economic sectors focuses on the present distribution of personal income.

For this analysis, sources of personal income are grouped into six sectors: (1) agriculture, including agricultural services, forestry, minerals, and oil and gas; (2) manufacturing; (3) construction and transportation; (4) wholesale and retail trade; (5) government, including schools; and (6) services, including finance, dividends, and "other" categories.

An area economy can be classed as dependent on an economic sector when this sector contributes more than 20 percent of area total personal income (Swanson 1992b; USDA 1990; Martin 1989). A key economic sector provides between 10 to 20 percent of area total income, while a minor economic sector contributes less than 10 percent of area personal income. Using information from the most recent years for which there are data, the 13 lower Missouri counties are easily classified as to sector economic dependence (see Tables 3-5 and 3-6).

173. **Comment**: The EIS states on page 84 that earnings from the service, finance, and other nonagriculture sectors are the largest sources of income for the lower Missouri River basin. Agriculture is the number one source of income for the lower Missouri River basin.

Response: As described in the draft EIS, page 84, the service sector is the largest source of lower Missouri River basin personal income, providing about one-half of total subbasin personal income. The draft EIS, Table 4-22 on p. 87, lays out the differences between gross basin agricultural sales (which totalled $409 million) and the net personal income received by farmers and ranchers (totalling $132 million).

174. **Comment**: Page 84, Taxation. The taxation of agricultural land should be reanalyzed and updated in terms of laws passed by the 1993 legislature on the taxation of agricultural property. Agricultural lands are no longer assessed at 30 percent of their productive capacity. Agricultural lands are subject to an updated formula which was contained in Senate Bill 168, passed by the 1993 legislature. This law will increase the valuation and taxes associated with irrigated land.

Response: The tax and assessment rates used in the draft EIS were the most recent tax data (1992) available at the time the draft EIS was prepared. New assessment rates effective January 1, 1994, were defined by Senate Bill 168 passed by the 1993 Legislature. Changes to assessment rates imposed by Senate Bill 168 apply to all classes of agricultural land and, at the time the legislation was passed, were intended to be revenue neutral to local governments. While the fiscal effect of the legislation may vary slightly from county to county, the overall effect will be small.

Appendix D shows a comparison of taxable values for agricultural land in the lower Missouri basin for 1993 and after the initial phase of legislative changes effective on January 1, 1994. The effects of the change in taxable value varied widely between counties. Most counties in the lower Missouri River basin experienced modest increases or decreases.

As an example of the effects of project development under the new tax rates, Richland County would have about 10,094 acres of new irrigated land under the Consumptive Use Alternative (Table 3-7). Of this, 4,915 acres are assumed to have previously been in dryland farms and 5,179 acres in grazing. The taxable valuation of irrigated land would increase by approximately $139,987, or by 21 percent. Under the old tax rates, the increase would have been $106,233, or a 20 percent increase in 1993 irrigated acreage taxable valuation. The new tax rates made a difference of about 1 percent. Compared to total Richland County tax and fee receipts of $2,134,782 in 1993, this $139,987 agriculture taxable value increase would increase county receipts by about $37,133, which would amount to a 1.7 percent increase in county government revenue. Other counties would experience similarly small increases in taxes from the proposed reservations for new irrigation.

175. **Comment**: Page 172, Employment, Income, Agricultural Sales, and Taxation - EIS estimates that the increased tax receipts derived from future development of the consumptive use reservation would be less than 0.5 percent. Roosevelt County government and the schools within our county depend on adequate taxable evaluations to operate. In 45R, rural Wolf Point, an acre of dryland farmland brings in $1.51 per year in taxes. There are currently 8,303 acres of tillable irrigated land in Roosevelt County. Under the Conservation District's reservation request, a total of 24,979 acres of cropland could be irrigated. This is another increase of 300 percent. These increases only speak of the increased land values. The county would realize additional tax revenue increases due to the assessments on irrigation equipment, machinery, and other improvements. Even more tax revenue would be generated by irrigation services and related industries.

Response: The assessed value and acres assessed in Roosevelt County in 1992 were:

	Tillable irrigated	Tillable dryland
Assessed value	$133,712	$10,448,524
Acres	4,932	546,654
Value/acre	$27.10	$19.18

The difference countywide in assessed value between dryland and irrigated farmland in 1992 was 41.2 percent. The comment is correct that irrigated land will bring in more tax dollars for local governments. This increase is reflected in Table 6-40 of the draft EIS, which indicates taxable value increases of up to 0.8 percent, depending upon the alternative, for the lower Missouri River subbasin.

176. **Comment**: S9, page 172, Tables 6-36 and on - The figures don't appear to reflect the economic realities of this area. Where are the figures to support these conclusions?

Response: The figures are based on widely recognized data from the U.S. Bureau of Economic Analysis (1993) in Washington, D.C., which are updated annually.

177. **Comment**: From Table 4-22, page 87 - Farm income is listed as 4.2 percent to 13.6 percent. From Table 4-23, page 88, agriculture taxable valuation is listed as 37 percent. What percentage of taxable valuation do agriculture related service and finance industries contribute? Interestingly, recipients of between 4.2 percent to 13.6 percent of the area's income provide 37 percent of the area's taxable valuation base.

Response: No data are available as to service and finance industries that are directly related to agriculture. Certainly, as evidenced by its high portion of related taxable valuation, agriculture is

Table 3-7.Comparison of taxable value using 1993 and 1994 tax rates in Richland County

1994 Tax Rates						
New irrigation	-	10,094 (acres)	@	$442.44/acre	=	$4,465,989
Dryland	-	4,915 (acres)	@	139.41	=	-685,200
Grazing	-	5,179 (acres)	@	29.77	=	-154,178
						$3,727,611
				'94 conversion factor	x	.0386
						$139,987

'94 irrigation taxable value ÷ 653,640 =21% of total '94 taxable value of Richland County agricultural land

1993 Tax Rates						
New irrigation	-	10,094 (acres)	@	$ 45.76/acre		$461,901
Dryland	-	4,915 (acres)	@	14.00		-44,470
Grazing	-	5,179 (acres)	@	3.73		-19,317
						$354,111
				'93 conversion factor	x	.30
						$106,233

'93 irrigation tax value ÷ 531,165 =20% of total '93 taxable value of Richland County agricultural land the primary property tax revenue source to local governments in the lower Missouri River basin.

178. **Comment**: Pages 56, 84, 172 - Conservation Districts apply to reserve water for beneficial uses. The draft EIS seems to downplay everything the conservation districts are trying to do (economic development, jobs). The final EIS should incorporate fairness and should not downplay the conservation districts' applications and goals.

Response: The granting of all or some of the water reservations may be important to local communities but would result in very small economic and employment effects for the basin and subbasins as a whole. The EIS did not intend to minimize or devalue the goals and development efforts of the conservation districts.

179. **Comment**: Page 61, population - The population of the area is turning down in most small eastern Montana communities. However, these communities have experienced short-term growth during boom times and, therefore, reservations for municipalities should be granted.

Response: The applicant requesting a water reservation is responsible for demonstrating that the requested water reservation is needed, using "accurate and suitable" methods (§ 85-2-36(4)(A)(iii), MCA). No municipality requested water for short-term energy "boom" times. If granted, municipal water reservations could provide a reserve in the event of such a boom.

180. **Comment**: On page 61, the EIS describes a downward trend in local population, but only over a short time period. The area is known for boom-bust cycling in population with trends reflecting the rise and fall of crude oil prices. Granting instream flows will prevent future development to meet industrial needs of those fluctuating population numbers.

Response: Long-term population trends for the past 40 years and projected populations for the next 45 years (through the year 2035) are described in the draft EIS Table 6-41 (p. 175) and in Appendix K (pp. K-1 to K-17) for municipalities requesting water reservations. As you indicate, these tables project a continuing downward population trend for about half of these municipalities. Granting any of the reservations would leave less water available for other uses. Municipalities, because of their condemnation authority, are in a unique position among the reservants to provide water for municipal purposes within their jurisdictions regardless of whether other reservations are granted.

181. **Comment**: The cost-benefit ratio that is used in your economic modeling in the EIS does not take into consideration the fragile environment that would be impacted by recreational users in McCone County. Recreation activities in McCone County are primarily hunting in the fall and fishing beginning in mid-May through October. Rock Creek Marina on Fort Peck Lake is our summer recreation area. In Western Montana, recreational use is degrading our resources and control measures are being implemented to curtail use at national parks, public lands, streams and rivers. The Smith River Recreational Use Plan is an example of these control measures. The Environmental Impact Statement does not address this future impact of recreation on our County budgets to provide roads, law enforcement, refuse disposal and other associated costs that recreation would impose on our County budgets.

Response: The lower Missouri basin water reservations would not be expected to affect either the water levels (draft EIS p. 177), or the recreation use levels of Fort Peck Lake. Water reservations would not affect current levels of local recreation use (draft EIS p. 165) and would provide very small changes in the economics of water-based recreation (pp. 166-168, draft EIS). These levels of recreation use would have virtually no additional effect on county-provided services.

182. **Comment**: On page 184 and Table 6-43, type of impacts and measures to reduce these impacts are listed. These seem pretty ludicrous.

Response: Table 6-43 merely represents options available to reduce impacts. Your comment is, however, noted.

183. **Comment**: How does DFWP rationalize reserving instream flows when agriculture has a far more reaching effect on the local communities when compared to recreation. The recreation dollars that flow into the local communities are gravy relative to the meat and potato benefits of agriculture. Communities won't exist without benefits of agriculture.

Response: DFWP is legally eligible to apply for reservations for instream purposes. The existing benefits received from recreation and agriculture generally would not be affected. However, a small portion of existing benefits from agriculture could potentially be affected. For example, if DFWP's reservations are granted, they would be senior to any water use permit issued in the lower Missouri and Milk river drainages after July 1, 1985, and after July 1, 1989, in the Little Missouri River drainage. The agricultural benefits from these junior water rights, which are listed in Tables A-3, A-6 and A-9 of the draft EIS, could be affected. However, persons holding junior water rights at the time the Board makes its decision may ask the Board to subordinate the reservations to their junior rights.

184. **Comment**: Does EIS show dollars generated by recreation relative to agricultural dollars?

Response: The draft EIS did not include dollars generated by recreation because these data are not readily available for the lower Missouri River basin.

185. **Comment**: Economic development to northeastern Montana and agriculture are an absolute must, and future reservation for irrigation by the involved counties SCS's must be granted ahead of DFWP's reservation. As an irrigator myself (Senator Larry Tveit) on two farms along the river, I know the potential for increased economies directly and indirectly is addressed negatively in the DFWP's application.

Response: As stated in DFWP's reservation application, the purpose behind instream flow requests is for the maintenance of a minimum flow, level, or quality of water by month and throughout the year to provide habitat for fish and wildlife, to benefit the public for recreational uses, to contribute to and maintain a clean, healthful and desirable environment, and to sustain adequate levels of water quality. These criteria will be used by the Board of Natural Resources and Conservation to decide whether to grant, grant in part, or deny DFWP's instream flow requests. How DFWP's requests may affect the various economies related to agriculture will be decided by the Board.

186. **Comment**: The source for the data in the tables (Economics Consultants Northwest) is not shown in the references.

Response: The following source should be added to the list of references in the draft EIS: Economic Consultants Northwest. 1993. Unpublished data developed from information published by the U.S. Bureau of Economic Analysis and the Montana Department of Revenue.

187. **Comment**: On page 80, Table 4-17, please provide information on how this table relates to studies conducted in the lower Missouri Basin.

Response: Table 4-17 shows that in two comprehensive statewide studies, fishing is the most popular water-based recreational activity for adult Montanans. The source for Table 4-17 is shown on page 77 of the draft EIS--McCool and Frost 1987--and has been added to the table in the final EIS.

188. **Comment**: McCone County has an agriculturally based economy, however, we have extensive Fort Union coal reserves that lie under and are owned by Burlington Northern Resources on their Dreyer Brothers ranch unit. McCone County also has oil and gas production. The EIS does not recognize water use allocation for these resources.

Response: The McCone County Conservation District's Water Reservation Application did not include specific water uses, such as those associated with the coal, oil, and natural gas industries, so DNRC did not include those considerations in the draft EIS.

The draft EIS recognizes that existing water rights for senior uses cannot be adversely affected by the reservations. DNRC did not consider major coal, oil, or gas development requiring large amounts of water to be reasonably foreseeable events, so did not consider them directly in the draft EIS. Reservations, however, could preclude future water uses.

189. **Comment**: I (Larry Tveit) am writing this letter in protest to the Montana Fish and Game request for 50 percent of lower Missouri water for instream flow. This amount of the river flow would shut down all attempts for future development in the area of irrigation and economic development beneficial to northeast Montana.

Response: Granting water reservations for instream uses might preclude other future uses of water (draft EIS, pages 72 and 102). Even if DFWP obtains instream flow reservations, some additional water would be available (see revisions to Appendix J in Changes to the Draft EIS). Further, the Fort Peck tribes also may have water available for future use by others through marketing provisions of Montana's compact with the tribes.

190. **Comment**: Page 195, paragraph beginning at the bottom of column 1. The paragraph states that "...net benefits would be increased by granting the reservations. In other words, the benefits of the consumptive uses exceed the costs of the instream flow losses." This is referenced back to Table 7-1. How do these numbers relate to the quoted statement? Some examples would be useful.

Response: Under the Combination Alternative, the benefits from the consumptive uses would be $20.82 million for irrigation and $39.36 million for municipal reservations, but the instream flow reductions caused by granting these consumptive use reservations would result in costs of $4 million for recreation and $21.94 million for hydropower production. Further, the cost of replacing electricity needed to operate the proposed irrigation and municipal projects would result in an additional indirect societal cost of $3.12 million. The bottom row of Table 7-1 is the total of all the subtotals in the table, and for the Combination Alternative the value is $31.13 million. This means that the reservations specified in the Combination Alternative would provide a positive net benefit to society of $31.13 million. Excluding the indirect societal cost of $3.12 million for replacement electricity, the benefits of the consumptive uses ($20.82 million + $39.36 million) exceed the costs of the instream flow losses (-$4 million + -$21.94 million).

191. **Comment**. Page 195, column 2, last paragraph, and Table 7-2. The benefits shown in Table 7-2 are the same as those for totals in Table 7-1. There should be some explanation and reference as to where the costs figures came from in the table.

Response: The cost figures in Table 7-2 reflect the values shown in Table 7-1. For example, under the Combination Alternative, the sum of the costs in Table 7-1 to recreation, hydropower production, and replacement power is $29.06 million while the sum of costs in Table 7-2 from irrigation and municipal also equals $29.06 million. In other words, Table 7-1 explains where the costs occur, while Table 7-2 explains what consumptive uses contribute to these costs. Therefore, of the $29.06 million in cost under the Combination Alternative, the irrigation reservations contribute $27.49 million.

192. **Comment**: This reach of the Missouri River is the last opportunity for Montanans to benefit from our greatest resource, water. The net present value of the beneficial uses of water from the last source of divertible water for Montana has not been fully analyzed by this EIS. When the water leaves our boundary, it is lost forever. Therefore, I (Allan Pipal) question the purpose of the water reservation process.

Response: Your comment on DNRC's analyses and the State of Montana's water reservation process is noted. DNRC believes that it has described to the extent possible most of the direct and indirect benefits and costs which would occur as a result of granting the proposed reservations under the various alternatives.

193. **Comment**: Need more in-depth studies relative to agriculture (all detailed study seems directed at recreation and DFWP requests).

Response: Chapter Seven and Appendix L of the draft EIS included an in-depth analysis on the consumptive value of water for irrigation. Consumptive use values were compared to the instream flow values in order to assist the Board in evaluating the "public interest" of the proposed requests. In particular, these comparisons assist the Board in determining if the benefits of reserving water for consumptive uses exceed the costs.

194. **Comment**: The draft EIS does not address the possibility of conservation districts sharing costs with USDA and how this would affect water reservation development.

Response: Government cost sharing programs are available to assist financially in developing irrigation projects. However, government subsidies are a transfer of wealth from one economic sector to another and therefore are not considered in a cost-benefit analysis.

195. **Comment**: The basic premise of the draft EIS is flawed. Economic analysis for irrigated land should provide realistic values assigned to agriculture.

Response: DNRC believes its economic analysis estimated realistic values for irrigation consumptive use water values, however, your comment is so noted.

IRRIGATION

196. **Comment**: Clarify between full service irrigation vs. water spreading.

Response: Full service irrigation projects would divert water as crop demands require throughout the irrigation season--the irrigation season usually is from May through September. Water for full service irrigation projects can be applied to crops by sprinkler or flood irrigation systems. A water source with dependable flows throughout the irrigation season is needed for full service irrigation.

The Carter County, Daniels County, Little Beaver, and Wibaux conservation districts have applied to reserve water for water-spreading projects. These projects use water from streams that flow infrequently--usually only during spring. During these infrequent flow events, water would be diverted from the stream and spread onto fields by a series of dikes and ditches. Due to the less dependable water supply, during most years water-spreading projects would use much less water per acre than full service irrigation projects.

197. **Comment**: Clarify water-spreading information (time employed, quantity used).

Response: A discussion of cost estimates for proposed water-spreading projects is included in Goroski (1993) which is referenced in the draft EIS. These costs include the general cost of labor; however, the number of labor hours per project are not specified.

A discussion of project design for water-spreading projects is included below. This example is quoted from the Little Beaver Conservation District Application for Reservation of Water. Similar discussions are included in the water reservation applications of the Carter County, Daniels County, and Wibaux County Conservation districts. The discussion briefly touches on how water spreading differs from full-service irrigation.

PROJECT DESIGN AND WATER REQUESTED

Water spreading involves the diversion of runoff from a stream channel and spreading it over relatively flat fields with a series of dams, dikes, or ditches. Water spreading differs from full-service irrigation in that water is only available during a short time each year. To be considered a potential site for water spreading, lands must have suitable topography and soils. Also, water in the form of runoff must be available on a somewhat reliable basis.

For water spreading, lands should be smooth and have gentle slopes. Areas of rough surface topography or with excessive rills and/or channels were considered not suitable because they would require surface leveling with associated high development costs. Slopes ranged from 1 to 5 percent, with the minimum slope required for drainage of excess water. Lands were included if they had soils which were medium to finely textured with moderate to slow rates of infiltration. Coarse soils usually have higher rates of infiltration and generally were not included because they do not make effective use of water applied at infrequent intervals. Soils were also evaluated for excessive amounts of salts. Once suitable project lands were delineated, it was necessary to determine if there would be adequate water available to service them.

It was assumed that one acre-foot of water per project acre would have to be available at least 8 years out of 10 for a project to be feasible. To evaluate this, runoff predictions were made based on the snow-melt runoff event with an 80% chance exceedence. The methods used are explained in the SCS engineering field manual (USDA undated). If the amount of the 80% chance snow-melt runoff in acre-feet was less than the area of the project lands in acres, the size of the project was scaled back. Because in most years more water would be available, the actual amount applied for in this application was the 1.5 acre-feet per year for each project acre considered. This amount is consistent with the maximum annual amount of water generally considered necessary for water spreading systems in eastern Montana (DNRC 1976).

The total water available for crop consumptive use is (1) that supplied by the water-spreading system, plus (2) that available from precipitation. It was assumed that the soil would absorb six inches of water for each acre-foot of water applied with the remaining six inches lost to evaporation or infiltrating below the soil profile. Hence, based on an annual water application of one acre-foot

> *per acre, the six inches of water would be absorbed by the soil and available for crop consumptive use. Weather station information for Ekalaka was used to determine annual effective precipitation, which was also considered available for consumptive use.*

198. **Comment**: Cattle production and how it relies on irrigation should be included in the draft EIS. Without irrigation, there would be dramatic impacts to cattle production. Are livestock operations included in DNRC's economic analysis?

Response: Cattle production was included in DNRC's economic analysis insofar as establishing the cost of production for a 7-year alfalfa and 1 year small grain rotation, and in forecasting the price of alfalfa. Since production costs vary with annual yields of different crops and with individual farm situations, it is important to determine farm size and farming practices in order to determine cost of production. DNRC determined that this would not only be difficult but impractical to do for every farm with a proposed water reservation. Therefore, after reviewing the 1987 Census of Agriculture, DNRC assumed a representative farm that has 460 acres of dryland crops, 240 acres of irrigated cropland, and enough rangeland to support 160 head of beef cattle. This "typical" small farm was used to establish production costs for all the proposed irrigation projects.

DNRC assumed that the alfalfa and small grain from the proposed irrigation projects would be sold at market price. The market price for alfalfa was forecast using a statistical relationship between the price of alfalfa and a number of variables shown to influence that price, including previous alfalfa prices, calf prices, wheat prices, statewide alfalfa production, and precipitation. It should be noted that even if the alfalfa is used on the same "typical" small farm operation to winter its beef cattle or to background calves, the cost of that alfalfa to cattle production is still the market price of alfalfa. In other words, the value added to cattle production from feeding alfalfa is the cost of the alfalfa which is already accounted for in DNRC's economic analysis.

199. **Comment**: Did anyone point out to you that the communities from Havre to the North Dakota border are dependent upon the livestock industry? Without irrigation and the resultant available hay, those farmers and ranchers will have no reliable sources of winter feed.

Response: Tables 4-22, 4-23, 4-24, 4-25, and 4-26 (pp. 87-90 in the draft EIS) indicate that about 44 percent of yearly total agricultural sales are livestock. Further, the basin's annual agricultural sales (both crop and livestock) averaged $408 million from 1989 to 1991 and supplied about 3 percent of total basin personal income. The proposed reservations would not affect the existing amount of water used for alfalfa irrigation, except for those junior water use permit holders listed in Appendix A of the draft EIS.

200. **Comment**: Several errors were found in the draft EIS, i.e. the economic analysis on pages 86 and 146 - alfalfa yields (tons/acre) seem very low. Need more research to obtain accurate yield data. Get yield and irrigated acreage information from conservation and SCS feasibility studies.

201. **Comment**: In the EIS you attempt to tell me that irrigated alfalfa yields are only 3 tons per acre. You base your figures on Montana Crop and Livestock Reporting Service. I called them up to check on your data. I found that the average yield for Roosevelt County was 4.3 ton. According to your EIS we should not be getting that kind of yield until after the year 2020. I also questioned how the data was accumulated. My yield on irrigated alfalfa was 6.2 ton; according to your EIS this is impossible.

202. **Comment**: Agriculture technology is continually changing with development of new crops and production techniques. For example, the 1980's irrigated alfalfa yield of 3.0 tons per acre as stated on page 86 is lower than the 1991 and 1992 lower Missouri subbasin counties' average of 3.7 and 3.9 tons per acre. What were the irrigated and dryland alfalfa yields used in the economic analysis?

Response to comments 200, 201, and 202. The main intent of the fourth paragraph on page 86 and the sixth paragraph under Land Use on page 146 was to indicate that alfalfa yields are likely to increase into the future given advancements in agricultural technologies. USDA (1989) forecast the increase to be approximately 31 percent over the next 30 years.

The 3.0 tons per acre discussed on page 146 was a 7-year average of all irrigated alfalfa yields in the lower Missouri River basin, as were the yields in Figure 6-14. As you point out, in particular years and for particular counties, local yields are much greater than the 7-year averages. In fact, Roosevelt County irrigated alfalfa yields averaged 3.6 tons per acre over the past 7 years with yields of 3.4, 3.8, 2.2, 3.4, 4.0, 3.9, and 4.3 from 1986 through 1992 (Montana Agricultural Statistics Service).

DNRC did not use these 7-year average yields in either its socioeconomic (p. 172) or its economic (p. 192) analyses. The socioeconomic analysis used 1992 alfalfa yields for specific counties (Montana Agricultural Statistics Service). These yields (tons per acre) are as follows:

County	**Yield**
Blaine	3.3
Carter	3.0
Daniels	3.3
Fallon	3.0
Liberty	3.0
McCone	3.1
Richland	3.7
Roosevelt	3.9
Sheridan	4.0
Valley	3.8
Wibaux	3.0

The economic analysis estimated alfalfa yields using precipitation and frost-free days at specific weather stations in the lower Missouri River basin, as well as accounting for the variation in yields over the life of an alfalfa stand. A more detailed discussion of how irrigated and dryland alfalfa yields were derived can be found in Goroski (1993). A summary of the irrigated and dryland alfalfa yields (tons per acre) from Table 3 in Goroski (1993) are as follows:

Yields by age of alfalfa stand (tons per acre)

Years after planting	1	2	3	4	5	6	7	
Weather station	Irrigated yields							Ave.
Culbertson	1.4	3.8	4.7	5.1	4.9	4.5	3.9	**4.0**
Ekalaka	0.8	2.2	2.7	3.0	2.9	2.6	2.3	**2.4**
Malta	1.5	4.1	5.0	5.4	5.2	4.8	4.2	**4.3**
Poplar	1.5	4.1	5.1	5.5	5.3	4.8	4.2	**4.4**
Scobey	0.7	2.1	2.6	2.8	2.7	2.5	2.1	**2.2**
Sheridan	1.3	3.8	4.6	5.0	4.8	4.4	3.9	**4.0**
Wolf Point	1.4	3.8	4.7	5.1	4.9	4.5	3.9	**4.0**

Years after planting	1	2	3	4	5	6	7	
Weather station	Dryland yields							Ave.
Culbertson	0.5	1.3	1.6	1.7	1.6	1.5	1.3	**1.4**
Ekalaka	0.5	1.4	1.7	1.8	1.7	1.6	1.4	**1.4**
Malta	0.4	1.2	1.5	1.6	1.5	1.4	1.2	**1.3**
Poplar	0.5	1.4	1.7	1.8	1.7	1.6	1.4	**1.4**
Scobey	0.5	1.3	1.6	1.7	1.6	1.5	1.3	**1.4**
Sheridan	0.4	1.2	1.5	1.6	1.5	1.4	1.2	**1.3**
Wolf Point	0.5	1.3	1.6	1.7	1.6	1.5	1.3	**1.4**

203. **Comment**: DNRC should use a 5- or 10-year average for alfalfa productivity rather than 70-year average.

Response: DNRC did not use a 70-year average for any agricultural value in its analyses. DNRC assumed a 70-year planning horizon when estimating the value of water for consumptive use. In short, the value of water was assumed to correspond to the incremental increase in annual net revenues which would result from converting an existing farm/ranch operation to an irrigation operation. These incremental increases in annual net revenues over a 70-year period were then discounted back to a single net present value to determine the consumptive use water value. DNRC stands behind the alfalfa yields used in both its socioeconomic and economic analyses. Refer to comment 202 for a discussion of alfalfa yield.

204. **Comment**: Does the economic analysis consider more than alfalfa-barley production?

Response: DNRC acknowledges that specialty crops exist in the lower Missouri River basin, but focused its economic analysis on the alfalfa-small grain rotation which is the basis for most farming operations in the area. After reviewing the Montana Agricultural Statistics (1991), DNRC noted that counties in the lower Missouri River basin had 66 percent of their total irrigated acreage in hay during 1989 and 1990 of which 79 percent was alfalfa. For more discussion regarding sugar beet production, please refer to Chapter Two of the final EIS.

205. **Comment**: Economic analyses are not based on figures relative to this area. Not site specific. Seem wrong for lower basin as a whole.

Response. DNRC used area-specific data in both its socioeconomic and economic analyses.

206. **Comment**: The value of irrigation as stated in the EIS is too low. Most of my farm is covered by reservation CBI-11. I (Milo Mattelin) now irrigate 560 acres instead of the 258 listed in the EIS. We are presently using a sugar beet-wheat rotation, over the past three years. We have averaged over 20 ton/acre beets and 60 bu/acre wheat. This rotation offers far greater returns than the alfalfa-barley rotation used to determine the benefits in the EIS. Holly Sugar in Sidney pumps 42 million dollars into the area economy, all this from about 30,000 acres of beets. If even part of the 157,994 acres for which water is being reserved in the EIS were developed, there could be a dramatic effect on the area economy.

Response: Please refer to comment 207 for a discussion on sugar beet production. As for the change in the amount of irrigated acreage, existing land uses were estimated using aerial photographs from 1986-1992, conservation district information, and on-site visits.

207. **Comment**: You also claim that alfalfa is the most profitable crop to raise on irrigation. Wrong again, had you checked at all, you would have found that crops such as sugar beets will more than double per acre income over alfalfa.

Holly Sugar Corporation currently contracts over 5,000 acres of sugar beets annually which are irrigated from the Missouri River. A portion of that acreage has been declining in productivity over the last several years due to rising ground water levels caused by silting in the river channel as water is slowed and backed up by the Garrison Dam in North Dakota. Areas upstream from Bainville to Glasgow represent the best opportunity to bring new sugar beet production into the area. Any possible expansion of the sugar refinery at Sidney would be limited if adequate irrigation water was not available to new irrigators along the Missouri River.

It would be shameful to create a circumstance where the economic well being of farmers and refinery workers was threatened by excessive restriction of irrigation potential along the Missouri.

Response: DNRC concurs with your statement and retracts the third sentence in the sixth paragraph under Land Use on page 146 of the draft EIS (see Changes to Draft EIS). Further, it should be noted that the economic section never stated that alfalfa was the most profitable crop. DNRC, however, stands by its assumption that the alfalfa-small grain rotation used in its economic analysis is one of the more profitable crop rotations, commonly found throughout the lower Missouri River basin.

DNRC is aware of the profitability of sugar beets as supported by Carol Flaherty's article entitled "Montana's $45 Million Industry: Sugarbeets" published in the Montana AgResearch, Spring 1992. Flaherty concluded the article with the following section entitled "Future of the industry."

> *Competition in the sugar industry is no longer limited to sugarcane. Fructose from corn has had a big impact on the industry, says Friede, as have sugar substitutes. Melin's guess about the future is that the sugar beet industry will maintain its present level of production, unless more sugar from outside the country is let into the United States. In which case, the industry could shrink.*
>
> *For now, "we tend to be a very bright spot in the economy of eastern Montana," sums up Melin. That bright spot produced a value per acre of about $868 in 1989 compared to $101 per acre for all Montana wheat that year the highest year since 1983. In addition, payrolls for sugar beet factory employees total about $9 million in eastern Montana.*

Please refer to Chapter Two of the final EIS for a general analysis of sugar beet production, and changes to Appendix J of the draft EIS which shows the amount of water that would be available for new uses if reservations for instream flow are granted.

HYDROPOWER

208. **Comment**: Page S-9, Table S-1 - DNRC should provide further explanation of costs to hydropower production.

Response: A discussion of how hydropower production costs were determined can be found on page 169 of the draft EIS.

209. **Comment**: The purpose of water reservations is to protect Montana's water from downstream states, yet the draft EIS (pages S-9 and 193) discusses loss of hydropower in downstream states as a result of water consumption in Montana. Why?

Response: The economic analysis in the draft EIS took into consideration both the benefits and the costs to society that would occur as a result of granting a water reservation.

One of the main reasons for having this reservation process is to build a strong legal basis for protecting Montana's share of Missouri River water in any future litigation with other states or in a congressional apportionment of the water among states (Chapter One, draft EIS). By including downstream hydropower losses, the draft EIS provides a strong and defendable analysis needed in justifying the reservation process and in building a strong legal basis.

210. **Comment**: Why are we concerned with providing flow for downstream states when its very possible that our own state of Montana may need the flows down the road. Once it's gone, it's gone. Then what do we do? It is our (Blaine County Conservation District) opinion that we should provide for our future in the best way we can.

Response: The draft EIS analyzes requests for water reservations in Montana. Providing flows for downstream states is not considered. The economic analysis does take into account indirect costs which may occur in downstream states in order to provide a strong, defendable analysis as is discussed in comment 209. The rest of the comment does not apply to the draft EIS but is noted.

211. **Comment**: In costs and benefits discussion, could DNRC delineate benefits to Montana (especially with respect to hydro)?

Response: Hydropower production costs which were calculated at the five downstream dams represent the increase in costs from using a more expensive form of electrical generation to replace lost hydropower production. The lost hydropower production occurs at facilities that are a part of a complex, integrated electrical grid system, and therefore the hydropower production costs can not simply be delineated by state in a realistic or meaningful manner.

A few of the complexities of the electrical grid system are as follows:

(1) the U.S. Army Corps of Engineers operates the five facilities, but the Western Area Power Administration (WAPA) markets the electricity that is produced at these facilities along with the electricity from other generating facilities;

(2) WAPA markets electricity throughout a seven state region in its Pick-Sloan Missouri Basin Program. In Montana, WAPA sells electricity directly to cooperatives, federal agencies, state agencies, irrigation districts, and an investor-owned utility, as well as having reclamation sales within the state. WAPA also markets electricity and capacity to Basin Electric Power Cooperative (Basin Electric), which in turns sells electricity to cooperatives in Montana;

(3) some of the electricity WAPA markets is purchased from non-WAPA suppliers or interchanged with other WAPA programs. Basin Electric happens to be one of the non-WAPA suppliers.

Given this information, the hydropower production costs presented in the draft EIS might affect ratepayers in seven states. In particular, cooperative and investor-owned utility ratepayers in central and eastern Montana may be affected depending on how WAPA, Basin Electric, the different cooperatives, and the investor-owned utilities change their rate structures to account for the cost increase from reduced hydropower production.

212. **Comment**: Page 169, first paragraph - Any impact on hydropower production on downstream states is generally dependent upon the operation of Fort Peck Dam and not the result of any reservation for the consumptive use alternative.

Response: New consumptive use reservations would affect hydropower production at downstream hydro facilities irrespective of the operations at Fort Peck. Since the five downstream dams rarely spill (comment 215), any new consumptive use would decrease instream flow and therefore decrease hydropower production.

213. **Comment**: The assumption that the instream flow leaving Montana will be used to generate hydropower is incorrect. This water could be used for a variety of uses including as usage for downstream states' irrigation projects. And presently is all the Missouri River flow used to generate hydropower at each downstream dam?

Response. DNRC never made the assumption that the instream flow leaving Montana would be used solely for hydropower generation. DNRC agrees that there are other downstream uses for the instream flow leaving Montana. However, any new consumptive uses will affect the electrical generation at downstream hydropower facilities as discussed above.

Please refer to comment 215 for a discussion on spills at the five downstream hydropower facilities.

214. **Comment**: Do all hydropower facilities below Fort Peck have the same capabilities as Fort Peck?

Response. Capabilities of hydropower facilities usually refers to installed kilowatts. According to the U.S. Army Corps of Engineers' Master Water Control Manual Missouri River (May 1993 Draft), the capabilities at Fort Peck and the five downstream hydropower facilities are as follows:

Dam	Maximum Capability (MW)
Fort Peck	185
Garrison	518
Big Bend	468
Fort Randall	320
Gavins Point	132
Oahe	786

Gavins Point has a lower installed capability than Fort Peck. The capabilities of the hydropower facilities are determined by gross head and flow. The maximum powerhouse capacity or maximum flow (cfs) through the six facilities is as follows:

Dam	Powerhouse Capacity (cfs)
Fort Peck	16,000
Garrison	38,000
Big Bend	103,000
Fort Randall	44,500
Gavins Point	36,000
Oahe	54,000

Only Fort Peck has the lowest powerhouse capacity. Even though Gavins Point has the lowest installed generating capability, its turbines can pass more water than Fort Peck.

215. **Comment**: Is all downstream water routed for hydropower or is any sent through spillways?

Response. As stated on page 4 in Volume 6D of the U.S. Army Corps of Engineers' Master Water Control Manual Missouri River (May 1993 Draft),

> *Because of the very large amount of flood control and other storage in the main-stem system reservoirs, nearly all of the water that flows into the Missouri River is used for power generation. Generally, floods in the Upper Missouri River basin are stored in the reservoirs and are used later for power generation by release through the powerhouses. It is only during rare flood events that water must be passed through the emergency spillways, thus bypassing the powerhouse. This happens most often at the Gavins Point Dam, where water releases have exceeded the discharge capacity of the powerhouse about 25 percent of the time.*

DNRC requested the spill data for the five downstream hydropower facilities from the U.S. Corps of Engineers. Their response is found in Appendix E.

216. **Comment**: Page 169, General Impacts & Considerations and Impacts to Hydroelectric Power Production. EIS states that none of the consumptive use reservations in the lower Missouri River basin would affect any hydroelectric generating facilities in Montana. This supports the idea that the consumptive use reservations are nondetrimental to the citizens of Montana.

DNRC estimates a loss to downstream states. While downstream power generation is not a beneficial use for Montanans and therefore not relevant to the State's reservation process, this DNRC claim must be refuted. It is unlikely that the downstream states would lose potential generating capability; that problem is alleviated by proper reservoir management. It is also highly probable that future technological advances will allow the current hydroelectric facilities to generate electricity more efficiently with the net result being more power generated with lower flows.

Response: DNRC stands by its analysis that consumptive uses will have an impact on downstream hydropower facilities which in turn will have an impact on the citizens of Montana, in particular the ratepaying members of rural electric cooperatives.

217. **Comment**: Page 195, column 1, paragraph at top of page - The subsidy costs to the rate payer shown in that paragraph and referred to in Table 7-1 do not appear to be in Table 7-1.

Response: The values discussed in the paragraph are in Table 7-1. For example, $0.78 million under the Instream Flow and Partial Granting alternatives is a summation of $0.60 million and $0.18 million, which are in the Replacement Power - Total row, and under the Instream and PGA columns.

218. **Comment**: What percentage of lower Missouri River irrigation projects are powered by electricity? Several are powered by propane or diesel fuel.

Response: Of the 472 irrigation projects proposed, 381 would use electricity to power irrigation pumps, 16 would use diesel fuel, and 72 proposed water-spreading projects would not require any form of pumping. Two requests are for stock water wells, but the power type (windmill or electricity) is not specified. One proposal is for general stock water use, but the application does not include specific location of type of use (well or dam).

RECREATION

219. **Comment**: Page 166 - Changes in Recreational Value, last paragraph - We (11 conservation districts) question the accuracy of Duffield's values and their applicability, in valuing recreation in eastern Montana. Water-based recreation is simply not a high priority in this area of Montana which is agriculturally based.

Too much is subtracted for lost recreation in Table S-1. On page S-5 under recreation, it states, "The small flow reductions that would occur in the Missouri River below Fort Peck Dam under any of the alternatives would have minor effects on recreation opportunities." The figures from the middle Missouri and Marias-Teton subbasins, $5.81/acre-feet July-August and $1.63/acre-feet for the rest of the year, are much too high.

Response: DNRC concurs with the comments that recreation in the lower Missouri River basin is not as important as in the upper Missouri River basin, particularly in the headwaters and upper Missouri subbasins. Further, DNRC acknowledges that the recreational values derived by Duffield for the middle Missouri and Marias/Teton subbasins are in all likelihood nontransferable to the Little Missouri subbasin. However, DNRC believes Duffield's recreational values derived for the middle Missouri and Marias/Teton subbasins are "realistic upper bound approximations" for the Milk and lower Missouri subbasins. These recreational values are $5.81 per acre-foot during July and August and $1.63 per acre-foot the rest of the year. These values are low when compared to per acre-foot values of up to $35.40 in the Madison, Gallatin, and Jefferson River drainages.

As stated on page 79 of the draft EIS, fishing is the most popular water-based recreational activity for Montanans and is expected to remain so. While angler use on the Milk River, the lower Missouri River below Fort Peck Dam and the Little Missouri River are low compared to angler use in the rest of the state, angler use on the Milk and lower Missouri rivers is comparable to that on the Marias River and Missouri River between Morony Dam and Fort Peck Dam. The fishing pressure (angler days) for 1989 and 1991 (two undated Department of Fish, Wildlife and Parks studies) on these rivers is as follows:

Missouri River	1989	1991
(below Fort Peck Dam)	10,747	5,966
(between Fort Peck Dam and Morony Dam)	12,038	19,454
Milk River	12,320	10,821
Marias River	5,292	4,293
Teton River	851	325
Musselshell River		
(Headwaters to Lavina)	1,680	3,204
(Lavina to mouth)	4,625	3,284
Box Elder Creek (Little Missouri subbasin)	unknown	155
Beaver Creek (Little Missouri subbasin)	351	52

The Little Missouri subbasin has definite recreational value, as indicated by the angler days in Beaver and Box Elder creeks. The recreational values from the middle Missouri and Marias/Teton subbasins should not be applied to the Little Missouri subbasin. See Changes to the Draft EIS. Further, DNRC does not believe that the time and expense needed to complete a recreational survey to determine the recreational value for the Little Missouri subbasin would provide enough information for a reliable statistical analysis.

220. **Comment**: Landowners have been fighting a contentious economic analysis done by Economic Professor Duffield for the Department of State Lands, yet Professor Duffield is included as a reference in the EIS. If Professor Duffield had much to do with draft EIS, the whole draft EIS is flawed. Need more balance between agricultural and environmental interests.

Response: DNRC referenced two separate studies by Professor Duffield in completing its economic analysis. The first study referenced in the draft EIS is entitled, "Instream flows in the Missouri River basin: a recreation survey and economic study." Duffield et al. undertook this study in cooperation with DNRC. Duffield et al. and DNRC jointly developed the survey instrument. DNRC implemented the survey and developed the data base, while Duffield et al. were primarily responsible for the analysis in the study. DNRC agrees with the recreational values found in this study and used comparable values between the upper and lower Missouri River basins in the economic analysis of values for instream flows in the draft EIS.

The second study entitled, "Economic Analysis of the Values of Surface Uses of State Lands," is referenced in Goroski (1993). DNRC reviewed this study carefully and found the region specific grazing values to be reasonable. DNRC used these grazing values to estimate the present value of net revenues for existing farming/ranching operations. The values that were used in DNRC's analysis were $7.13 per AUM (Animal Unit Month) for Daniels, McCone, Richland, Roosevelt, Sheridan, and Valley counties, and $8.16 per AUM for Blaine, Carter, Fallon, Liberty, and Wibaux counties.

DNRC stands behind its economic analysis and the inputs used. Further, DNRC believes that it has captured to the extent possible most of the direct and indirect benefits and costs, and therefore believes its analysis is well balanced. DNRC is not aware of any other comparable studies that would offer additional values for DNRC or Board consideration, and no comments on the draft EIS suggested the existence of any such studies.

221. **Comment**: Page 166. To better understand the value of water for recreation that Duffield calculated for the upper basin reservation process, it would be helpful to provide more information in the EIS on how these values were determined, rather than simply referencing Duffield's study, which most folks have never seen.

Response: The recreational values in Duffield (1990) were estimated using a contingent valuation method (CVM), which is one of the methods recommended by the U.S. Water Resources Council (1983) for valuing recreation in federal cost-benefit analyses. Under the CVM approach, individuals are directly surveyed on their willingness to pay for the services of a given resource contingent on the existence of a hypothetical market situation. This technique has been applied to a wide range of environmental and resource issues, including air and water quality changes, scenic beauty, wildlife, and instream flows. Water is a public good with no market established value, and CVM is one of the widely accepted and recommended methods of estimating values for water uses. For more information on how the recreational values were determined, please refer to Duffield's "Instream Flows in the Missouri River Basin - A Recreational Survey and Economic Study."

MUNICIPAL

222. **Comment**: Where does the municipal value of $26.53 million on page 194, Table 7-1 come from?

Response: The value was estimated as discussed on page 193 of the draft EIS. The municipalities included in the lower Missouri subbasin may be found in Table L-3 on page L-14 of Appendix L.

223. **Comment**: Page 193, column 2, under Municipal Use: Need a brief statement stating why Hill County Water District's water charge of $2.68 per thousand gallons was used for analyzing all of the municipal reservations benefits. Also, in that paragraph, the 43.03 million dollar net municipal benefit does not appear in Table 7-1 as indicated in that paragraph. Table 7-1 shows the net benefit to be 39.36 million dollars.

Response: The direct net benefits of reservations for municipal water use can be measured by subtracting costs from total willingness to pay. Consumers' willingness to pay in the municipalities is not known. DNRC assumed that consumers are willing to pay at least as much for water as charged by the Hill County Water District. Hill County charges more for water than other municipal applicants. This assumption underestimates the net benefits of municipal water use. DNRC believes Hill County Water District's water rate is a reasonable approximation.

The $43.03 million net municipal benefit is a summation of the $39.36 million under the Consumptive, Combination and Instream alternatives and the $3.67 million under the Grant All Alternative, Partial Granting Alternative, and Coordinated Groundwater Development Alternative in Table 7-1.

224. **Comment**: In reference to Table 7-1, page 194, (a) does the municipal water volume used to calculate benefit cost analysis represent only water from Missouri River and its tributaries? (b) Is water from wells included in the benefit-cost analysis for municipal water?

Response: (a) No. (b) Yes.

BOARD DECISION CRITERIA

225. **Comment**: What criteria will the Board use to grant/not grant water reservations?

Response: These criteria are discussed in Chapter Seven - Board Decision Criteria of the draft EIS.

226. **Comment**: Page S-8, Public Interest - The definition of "public interest" is needed. It is the contention of the conservation districts that public interest should be analyzed in the context of what is best for residents of Montana and the lower basin. These criteria should be clarified.

Response: The definition of "public interest" used by DNRC in preparing the draft EIS can be found in ARM 36.16.105C APPLICATION CONTENT - PUBLIC INTEREST. The rule reads, in part, as follows: (1) In making a showing that the reservation is in the public interest, the application shall contain the following: (b) A discussion of indirect benefits and costs associated with applying water to beneficial use that considers the following: (iv) the economic opportunity costs that the requested flow may have to parties other than the reservant. Since parties was not defined to include only Montana residents or residents of the lower Missouri River basin, DNRC included economic opportunity costs that may occur downstream.

GENERAL

GENERAL

227. **Comment**: Can the Board condition reservations to allow other future uses?

Response: Yes.

228. **Comment**: DFWP not only wants all the land in the area (lower Missouri River basin), but now they want all the water as well. Where is the common sense? The EIS needs to address DFWP's request with more common sense. DFWP seems uncontrollable; wants control of land and water.

Response: As a state agency, DFWP is legally entitled to apply for water reservations. When opting to do so, DFWP applied for reservations in amounts that agency felt were necessary for the purposes stated in its application. The Board of Natural Resources and Conservation will determine the appropriateness of DFWP's and all other reservation requests when deciding whether to grant, grant in part, or deny them.

In preparing the draft EIS, DNRC described the proposed reservations, identified alternatives to the proposed reservations, assessed the environmental impacts of the proposed reservations, and evaluated the proposed reservations based upon the statutory decision criteria required for the Board's consideration in this matter. In satisfying these requirements, DNRC treated all reservation applicants equally and objectively. DNRC is comfortable with the level of "common sense" used in preparing the draft EIS.

229. **Comment**: Who drafted this EIS?

Response: DNRC drafted the EIS. See the final page of the draft EIS for a list of contributors.

230. **Comment**: Many of the conservation district reservation requests are for water spreading. It would be helpful if Table 3-1 would show which of those projects are water-spreading projects. This has been done in Table G-3, but it also would be helpful to have it in Table 3-1.

Response: Water-spreading projects already are indicated by an "a" in the Peak Flow (cfs) column in Table 3-1 of the draft EIS.

231. **Comment**: Page 18, Map 3-4 - The Carter County line is not shown on the map.

Response: The Carter County line is indicated on Map 3-4.

232. **Comment**: The draft EIS appears to favor the Instream Flow Alternative. The City of

Culbertson is located within the boundaries of the river basin, and it is within the city's best economic interest to encourage future irrigation development in Roosevelt County.

Response: In preparing the draft EIS, DNRC identified a range of alternatives with respect to the Board's actions on water reservation applications--one favoring consumptive uses, one favoring instream flows, a combination alternative which blended instream flows and consumptive uses, and a no action alternative. In its presentation of these options, the draft EIS defined the full spectrum of alternatives available to the Board and analyzed the environmental impacts under each. DNRC is confident that the methods and analyses used to develop the draft EIS in no way favored any of the alternatives presented. It is up to the Board to decide how best to distribute the benefits related to reservations based upon the public interest criteria and other statutory criteria required for its consideration in this matter. DNRC will not recommend a preferred alternative as part of the EIS.

233. **Comment**: You will find from reading the comments you will receive from area farmers, ranchers, and other interested persons, many conclusions in the draft EIS are based on data that is suspect. It seems to us (Roosevelt County Commissioners) that the draft EIS is really nothing but a justification for the appropriation of lower Missouri River water by Fish, Wildlife and Parks without consideration to the impact on the people who live in the area.

I (Doug Smith, Bainville) can turn to just about any page in this EIS and find incorrect data. I suggest you throw out this draft and start over and do the job correctly.

Response: Where specific examples of incorrect data have been shown, DNRC has made the appropriate changes. In preparing the draft EIS, DNRC used the best available data and information. For example, hydrologic data were acquired from the U.S. Soil Conservation Service, the U.S. Bureau of Reclamation, and the U.S. Geological Survey. Agricultural data were acquired from the Montana Crop and Livestock Reporting Service. These entities offer up to date and complete data for their respective areas of expertise. In addition, DNRC performed field investigations to ensure an understanding of the prevailing conditions.

234. **Comment**: Setting priority dates for beneficial water use permits is serious business. The Board, in doing so, is charting the future course of people's lives and livelihoods. This can only be done correctly by using information which provides a true and accurate representation of the lower Missouri River basin. Hopefully, the Montana DNRC final EIS will provide that information in such a fashion.

Response: The Montana Legislature established the priority dates for water reservations. Only in the event that two or more conflicting reservations are granted will the Board decide priority among them. Also see the response to comment 233.

235. **Comment**: On page 44, please explain the following statement, "Montana would like to see recreation and fish and wildlife considered primary users of water in the Missouri River system."

Response: At present, Fort Peck Reservoir is operated primarily for navigational benefits downstream from Sioux City, Iowa, and for municipal and industrial needs in several downstream states. To accomplish these goals, the Corps of Engineers generally draws down the reservoir and subsequently diminishes the amount of water available for recreation and fish and wildlife habitat. Since some of the more significant benefits of Fort Peck reservoir's operation for Montana are recreation and fish and wildlife habitat, Montana would benefit if the reservoir were maintained at a higher level. For this to be possible, the Corps of Engineers would have to consider recreation and fish and wildlife habitat as primary uses of Fort Peck waters along with downstream navigation and municipal and industrial needs.

236. **Comment**: If DFWP gets a reservation, attempting to obtain a 310 Permit could become an exercise in futility for landowners.

Response: Table 1-1 of the draft EIS addresses the regulatory responsibilities of both DFWP and conservation districts regarding issuance of permits for disturbance of streambeds and streambanks. It is not within the authority of the Board to change the laws requiring these permits. Granting or denying the requested reservations should have little bearing on the process landowners must adhere to in order to obtain a permit to disturb the bed or banks of perennial streams. Reservants wishing to obtain a permit under the

Streambed Preservation Act would still have to apply to the local conservation district for the permit and DFWP would still have the opportunity to review the request.

237. **Comment**: If a state agency must reserve water for future use, let it be DNRC. With DNRC, we (Phillips County Board of Commissioners) may at least have a chance to use the water for economic development in the future.

Response: DNRC considered very carefully whether to submit an application as part of the Missouri River Water Reservation Proceeding. After much deliberation, DNRC determined that applying to reserve water in either the upper or lower Missouri River basins was inappropriate since the Department has no interests (existing or future water-related projects) in either basin. DNRC would apply to reserve water only in the event that such interests were present, as in the Yellowstone River basin where the Department obtained a reservation for an enlarged Tongue River Dam.

Even without any reservations, water availability will continue to be limited in Phillips County. Because of persistent water shortages, no new permits are being issued for direct diversions without storage from the Milk River in Phillips County from June 15 to September 30. See draft EIS, pages 37-39.

238. **Comment**: Page 1, paragraph 6 - The draft EIS states that it is to be an information document for the Board of Natural Resources and Conservation, which is the ultimate decision maker on water reservations. As such, the draft EIS should not be viewed as a decisional document, and accordingly any conclusory statements regarding the feasibility or advisability of certain projects should be modified as the ultimate decision rests with the Board.

Response: DNRC agrees that the draft EIS should be an informational document for use by the Board of Natural Resources and Conservation (Board) in arriving at its decision on water reservations and not a decision-making document. DNRC did draw conclusions from the data, where appropriate. Analysis contained in the EIS along with information presented through the hearing process will comprise the record for a decision by the Board. If you have additional information to support a particular project or group of projects, you may wish to present this material during the contested case hearing.

239. **Comment**: Nobody wants a dry creek, but we can't have the water and let it go too. What does DFWP wish to do?

Response: Please see page 20 of the draft EIS for a summary of the purpose of DFWP's reservation request.

240. **Comment**: Why didn't Hill County Water District apply in the upper basin proceeding? Applications for water in the upper Missouri basin were to be filed by 1989.

Response: Please see page 125, column 2, of the draft EIS.

241. **Comment**: The EIS does not assess possibilities of instream flow development from projects other that DFWP's nondevelopment alternative.

Response: The possibility of using storage to provide instream flows is discussed on page 126 of the draft EIS. DNRC is aware of no reasonably foreseeable plans to develop water for instream flows.

242. **Comment**: The draft EIS doesn't address the proposed rural water district system out of the Missouri River that would serve small towns and rural water users in Roosevelt and Sheridan counties and help them meet EPA standards. Replenishment of water to the Medicine Lake Wildlife Refuge is not discussed.

Response: Culbertson states in its water reservation application that it is planning to provide treated Missouri River water to the Roosevelt Rural Water User District in the future. It has requested water in its reservation application so the district's water system can serve 160 to 180 farms and several small communities. A separate environmental review of this project (an EIS or environmental assessment "EA") probably will be required before it can be built. Please see page 36, column 1, of the draft EIS for a discussion of water diversions by the USFWS into Medicine Lake.

243. **Comment**: Page 123, paragraph 6 - The statement regarding the granting of a reservation for consumptive uses as reducing the amount of water available for new appropriations should also include the fact that granting the reservations for instream use will have a more significant impact on new permits. Due to the quantities and timing requested by DFWP for instream flows, the effect of granting instream reservations will be significant.

Response: The amounts of water remaining if instream requests are granted are summarized in revisions to Appendix J of the draft EIS (see Changes to the Draft EIS). This revised appendix shows that during much of the year on many streams, little water would be available for future appropriation if instream requests are granted. Note that this table does not factor in restrictions on availability posed by existing water rights which would be senior to DFWP's reservations, if granted.

244. **Comment**: We (Roosevelt County Commissioners) found no notification of the meeting held November 16, 1992, in Wolf Point, either in our county (Roosevelt County) correspondence files or in our minutes. There was no notification in the "Public Notice" section of our county newspaper. The only item we found was the enclosed news release in the November 5, 1992, edition of "Herald News" and it does not address the complexity and seriousness of the issue. On the night of November 16th there was poor weather; Bruce Wright from McCone County was the only person in attendance who represented agricultural interests. Agriculture is northeast Montana's number one industry. In fact, it is the major economic force for all of Montana. The point is, shouldn't you have been more diligent in pursuing input from that sector of the population? It is very evident from the enclosed list of government agencies, local organizations, and individual farmers and ranchers who have objected to the request of Fish, Wildlife and Parks for the reservation of water, that their concerns are not addressed in the draft EIS prepared by DNRC.

Response. Press releases describing the EIS scoping meetings and reservation requests were sent to all newspapers of general circulation in the basin, including the Wolf Point Herald News. Display adds for the scoping meetings were run in the Glasgow Courier on November 5 and 12, 1992; the Miles City Star and Havre Daily News on November 11 and 13; and the Billings Gazette and Great Falls Tribune on November 11 and 15. Radio announcements of the meeting were made in Wolf Point and Plentywood the day of the meetings. A newsletter which described the reservation process and reservation applications in the lower Missouri basin and contained a scoping meeting schedule was sent to reservation applicants and other individuals and groups in the basin in October 1992. This newsletter was sent to the county commissioners of each basin county. Eight people attended the Wolf Point EIS scoping meeting which was held on November 17, 1992.

245. **Comment**: The Instream Alternative model presented in the EIS for instream reservation for fish, wildlife, and recreation does not quantify amounts of water needed to sustain acceptable levels of fish population, upland bird population, aquatic bird populations, and recreational uses.

Response. The alternatives presented in the draft EIS were intended to bracket the range of possible actions the Board may take on the reservations. In developing these alternatives, DNRC did not attempt to quantify the exact amount of water needed to sustain "acceptable" populations of fish, upland game birds, waterfowl, or to optimize the amount of water available for recreational uses. As can be seen from the divided opinions expressed in these comments, determining what is "acceptable" to all interested parties will not be an easy task for the Board.

246. **Comment**: The EIS does not address the full relationships of DFWP methodology and development of surface water resources by agriculture conservation practices. DFWP used professional judgment to estimate the instream flow requested. The McCone County Commissioners feel other conservation efforts need to be studied to establish base flow on Redwater River reaches to meet the needs and goals of wildlife, fisheries, and recreational uses.

Response: DFWP applied to DNRC for a reservation of water for instream flow. Appendix C was included in the EIS to help explain how DFWP determined the amount of water it thought necessary to protect aquatic habitat. As explained in Appendix C, a considerable amount of thought went into determining how much water was requested.

DNRC did not feel that development of surface water resources by agricultural conservation practices addressed the needs for the reservations described by the applicants and therefore was not considered a reasonable alternative. However, DNRC did briefly discuss storage as an alternative to instream flows on page 126 of the draft EIS.

247. **Comment**: An instream flow reservation on the Redwater River would effectively close the Redwater basin to any further conservation practices to be implemented by agriculture and would be detrimental to our economy in McCone County.

Response: Your comment is noted. The amount of water remaining for appropriation in the Redwater River, should DFWP's reservation be granted, is shown in revisions to Appendix J (see Changes to the Draft EIS).

248. **Comment**: Need more specificity in language; get rid of nondescriptive terms (i.e., should, might, etc.).

Response: Your comment is noted. DNRC used qualifiers to reflect uncertainty.

ENFORCEMENT/MONITORING

249. **Comment**: How do instream flow reservations work when water is not available at some times of the year?

Response: If water is not available and junior water users are not diverting, then the instream reservation would not be satisfied. If junior users are diverting water, their rights would be subject to call by DFWP. See Appendix I of the draft EIS for DFWP's proposed management plan.

250. **Comment**: Who can "shut down" a junior reservant?

Response: Any potentially affected senior water right holder has the authority to "shut down" a junior reservant.

251. **Comment**: How would DFWP enforce a water reservation "upstream" of the reach that has a reservation (junior users on upstream tributaries)?

Response: See Appendix I (p. I-4) of the draft EIS for a discussion of DFWP's proposed reservation management plan and associated enforcement activities. Please remember that upstream junior water users are subject to call by any senior downstream water right holder.

252. **Comment**: Can DFWP claim water upstream of the instream reservation?

Response: If DFWP obtains a water reservation, it would have the authority to call on water upstream from the reservation, but only from junior upstream water right holders, who would be subject to call by any senior downstream water right holder. However, the Board of Natural Resources and Conservation has the option to subordinate a water reservation to specific water use permits issued after the priority date of the reservation if it finds that such subordination would not interfere substantially with the purpose of the reservation (§ 85-2-331(4), MCA).

253. **Comment**: How would reservations be monitored and who would pay for monitoring?

Response: It would be up to the individual reservants to perform and pay for any monitoring of the water reservations they obtain. As an example of such efforts, see DFWP's proposed management plan which is included in Appendix I of the draft EIS.

254. **Comment**: If DFWP obtained an instream flow reservation (i.e., on the West Fork of the Poplar River), could it call water from upstream tributaries?

Response: Yes, DFWP could call water from upstream junior water rights, including those on tributaries

255. **Comment**: Would DFWP "call" water from Fresno Reservoir (if DFWP had a reservation) or would this water be taken by senior users?

Response: DFWP could not "call" water from Fresno Reservoir because any reservations the Board of Natural Resources and Conservation might grant that agency would be junior to existing storage rights for Fresno water.

256. **Comment**: Can an existing water right be affected by a downstream reservation--i.e., early water right (pre-1985) for a dam to be rebuilt?

Response: No, the Board cannot grant any reservations that would adversely affect senior water rights. Any water rights effective prior to the priority dates of the proposed reservations (July 1, 1985, for reservations granted in the lower Missouri River and Milk River basins and July 1, 1989 for reservations granted in the Little Missouri River subbasin), therefore, could not be affected by those reservations.

257. **Comment**: Can an existing water right be affected by a downstream reservation--i.e., after 1987 water right for a dam to be rebuilt?

Response: Yes, depending on the river basin. Water reservations granted in the lower Missouri

River and Milk River basins would have a priority date of July 1, 1985, and subsequently would be senior to any water use permits granted after 1987. In such cases, applicants obtaining water reservations would have the authority to call on junior water right holders. Again, it is important to point out that the Board of Natural Resources and Conservation could subordinate those reservations to specific water use permits issued after the priority date of the reservations if it finds that such subordination would not substantially interfere with the purpose of the reservation.

In the Little Missouri River subbasin, any reservations granted by the Board would have a priority date of July 1, 1989, making them senior only to water use permits issued after that date. The option of subordination would still be available for the Board's consideration in cases where water use permits were issued after July 1, 1989.

258. **Comment**: Can an existing water right be affected by a downstream reservation—i.e., if I want to move the location of a water right?

Response: Yes. When DNRC receives an Application for Change of Appropriation Water Right, all potentially affected water right holders (junior and senior) are notified and provided the opportunity to object. DNRC then determines whether any water right holder (junior or senior) would be adversely affected. If so, the Application for Change of Appropriation Water Right will be denied by DNRC.

259. **Comment**: Milk River downstream water users can't afford to police existing water rights, much less water reservations.

Response: Comment noted.

260. **Comment**: Addressing Appendix J in regards to water availability—What is the DFWP management plan (especially for Milk River tributaries)?

Response: See Appendix I in the draft EIS for a description of DFWP's proposed management plan.

261. **Comment**: Is there any guarantee that DFWP would not claim all upstream tributary water (at North Dakota border) (i.e., on Milk River)?

Response: By law, when granting water reservations, the Board is limited to the amount of water requested by an applicant (or less if the Board sees fit). On gauged streams, the Board cannot grant instream flow reservations for more than 50 percent of the average annual flow of record. Under no circumstances can the Board grant reservations in amounts greater than originally applied for. Since there are existing water rights in the Milk River basin that would be senior to any reservations DFWP might obtain, it would be impossible for DFWP to claim all upstream tributary water.

262. **Comment**: How will reservations and other water rights be enforced?

Response: The district court supervises the distribution of water among all appropriators. This supervisory authority includes the supervision of water commissioners who oversee the distribution of water on some streams when water decrees are in effect. The district court's supervision of water is governed by the principle of first in time is first in right (§ 85-2-406, MCA).

PROCEDURAL CONCERNS

263. **Comment**: How are priorities determined among various applicants (irrigation, cities, and instream)?

Response: See page 91 of the draft EIS.

264. **Comment**: Who developed the list of priorities associated with the various alternatives in the draft EIS?

Response: DNRC developed the alternatives and priorities presented in the draft EIS to bracket the range of possible Board actions on reservation requests. The Board is not limited to a particular alternative or list of priorities when making its final decision on reservations.

265. **Comment**. The EIS is being pushed through too fast. People need a sufficient amount of time to review and respond.

Response: DNRC is fully aware of the time constraints related to the EIS schedule. Since the Montana Legislature mandated a December 31, 1994, deadline for the water reservation proceeding as a whole, however, we must adhere to the proposed EIS schedule. DNRC provided 45 days for review and comment on the draft EIS, and thus exceeded the statutory requirement of 30 days (ARM 36.2.532(2)).

266. **Comment:** Not once did the DNRC contact our group (Lower Fort Peck Missouri River Development Group) for input into the EIS process as required by law under The Montana Environmental Policy Act.

Response: DNRC made numerous efforts to facilitate public involvement in the EIS process, including (1) soliciting public input (prior to the preparation of the draft EIS) on the type of information and analyses the EIS should contain to fully address the environmental, social, and economic issues relating to the reservations; and (2) seeking public comments on DNRC's initial efforts to meet those needs in the draft EIS. The former of these two efforts took the form of five scoping meetings which were held in November of 1992 at locations throughout the lower Missouri River basin. Notice of the scoping meetings was sent to all newspapers of general circulation in the basin, including the Glasgow Courier, the Miles City Star, the Havre Daily News, the Billings Gazette, and the Great Falls Tribune.

The public comment meetings were held in March of 1994 at the same locations as the scoping meetings. Advertisements and legal notices of the public comment meetings (and the availability of the draft EIS) were published in 18 regional and local newspapers, with news releases once again being sent to radio stations throughout the study area. DNRC staff delivered radio interviews regarding the public comment meetings in Glasgow and Plentywood. Overall, DNRC believes these measures constituted a reasonable effort to involve the public in the environmental review process and therefore satisfied the requirements of MEPA.

267. **Comment**: The implementation of using wildlife to enhance natural environmental conditions is not addressed. For example, using beaver as a management tool has been shown to be successful in Idaho and Oregon as well as in the western part of Montana.

Response: As mandated under the Montana Environmental Policy Act (MEPA), DNRC considered the proposed reservations and reasonable alternatives to the proposed reservations. The use of wildlife (i.e., beaver) as a management tool for enhancing environmental conditions was not included in any water reservation application. Furthermore, since use of wildlife to enhance natural environmental conditions did not appear to satisfy the purposes of the proposed reservations, DNRC did not consider it to be a reasonable alternative.

268. **Comment**: Rangeland resource management has not been considered along with other conservation methods that are being utilized by agricultural producers. These measures are cost-shared with the United States Department of Agriculture and other agencies. All of these projects would be scrutinized and rejected by DFWP in their attempt to maintain absolute control over agriculture.

Response: No water reservation applications were received to reserve water for range management purposes. Proper range management techniques and benefits are outside the scope of the water reservation process.

269. **Comment**: The McCone County Commissioners have supported agricultural conservation practices--for example, dams for wildlife, cattle, fishing; water-spreading systems; range resource management; and other beneficial uses of water. The EIS doesn't put any emphasis on this county's attempts to utilize water for the benefit of our citizens or our environment.

Response: The actions of the McCone County Commissioners are laudable. The purposes of the reservation statute and the commission activities have the same basic objectives of encouraging sound beneficial use of Montana's water resources. The purpose of the EIS, however, is to provide information necessary for good decision making regarding the water reservation applications filed with the Board.

270. **Comment**: How does the Board "review" the reservations that have been granted?

Response: See page 4 of the draft EIS.

271. **Comment**: Would DFWP develop water storage for instream flows?

Response: DFWP has not proposed to develop water storage projects that would supply reserved water for maintaining instream flows.

272. **Comment**: Would the Board throw out DFWP applications that stifle future economic development?

Response. The Board's decision criteria are described in Chapter Seven of the draft EIS. In addition, the Board will consider the record of evidence from the contested case hearing when making its decision on water reservations. It is not known how the Board will weigh this information during its deliberations.

273. **Comment**: Do these reservations include groundwater?

Response: Yes, and in fact much of the draft EIS specifically addresses water reservation applications involving groundwater. In the Sheridan County Groundwater Area, an entire set of alternatives has been proposed to address the unique nature of groundwater reservation applications. See the draft EIS Table of Contents for sections related to groundwater.

274. **Comment**: How would a new stock well be affected by granted reservations?

Response: See pages 112-122 in the draft EIS for a discussion of the impacts of granting proposed groundwater reservations.

275. **Comment**: How does DNRC figure "adverse effect to existing water rights?"

Response: DNRC does not decide whether proposed reservations would adversely affect other water rights. That decision rests solely with the Board of Natural Resources and Conservation. The Board is a seven-member citizen panel appointed by the Governor and is associated with DNRC only insofar as DNRC acts as staff to the Board. To determine whether proposed reservations adversely affect existing water rights, the Board will examine the reservation applications themselves, the draft and final environmental impact statements, and the record of the contested case hearing to be conducted in the matter.

276. **Comment**: Who determines the legitimacy of DFWP requests (i.e., Clear Creek)?

Response: As with any reservation application, the Board of Natural Resources and Conservation will evaluate the merits of DFWP's reservation requests (including Clear Creek). In assessing the legitimacy of the reservation applications, the Board will consider the applications themselves, the draft and final environmental impact statements, and the record of the contested case hearing. The authority to grant, grant in part, or deny water reservations rests solely with the Board.

277. **Comment**: Are decisions on reservations permanent?

Response: No. See page 4 of the draft EIS.

278. **Comment**: Will the Board be at the contested case hearing? Can the hearing examiner accurately relate the various interests (i.e., agricultural interests)?

Response: The members of the Board of Natural Resources and Conservation can attend all or part of the contested case hearing to be conducted in the matter of lower Missouri River basin water reservations. Regardless of whether the members of the Board attend the hearing, however, the hearing examiner, who was appointed by the Board, will hear the entire contested case hearing and present the official record of the hearing to the Board.

279. **Comment**: Page S-7, last sentence – Add technology in addition to economic concerns.

Response: DNRC's summary statement regarding the need for water reservations, as expressed by the applicants, reflects only the needs indicated in the water reservation applications themselves. Since a changing technological climate was not expressed by the conservation districts as a need for water reservations, DNRC is not at liberty to state it as such.

280. **Comment**: How is priority determined?

Response: The Montana Legislature assigned the priority dates of water reservations granted under the Missouri River Water Reservation proceeding. Reservations granted in the lower Missouri River and Milk River basins will have a priority date of July 1, 1985, whereas reservations granted in the Little Missouri River subbasin will have a priority date of July 1, 1989. In the event that two or more potentially conflicting reservations are granted, the Board of Natural Resources and Conservation will have to determine priority among them.

281. **Comment**: Page 184 - Measures to Reduce Impacts; page 181 - Additional measures - totally in favor of environmental group/interests. Table 6-43 is not relevant to water reservations.

Response: DNRC is required by the Board's administrative rules to include "a discussion of mitigation, stipulations, or other controls committed to and enforceable by the agency or other government agency."

Mitigation is defined to mean: "a) avoiding an impact by not taking a certain action or parts of an action; b) minimizing impacts by limiting the degree or magnitude of an action and its implementation; c) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; or d) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action or the time period thereafter that an impact continues."

DNRC prepared the list of mitigating measures in Table 6-43 of the draft EIS to satisfy these rules without regard to favoring one group over another. If you have additional measures that should be considered by the Board, or some that are not relevant but included in Table 6-43, you may wish to bring this information to the Board's attention at the contested case hearing.

282. **Comment**: How do DFWP's methods compare to conservation district and municipalities' methods? How can the Board compare instream flow requests with consumptive use requests?

Response: A discussion of the methods used by the applicants is presented in Chapter Three of the draft EIS. In Chapter Seven of the draft EIS, the costs and benefits of the various reservation applications are compared. The Board must determine whether the methods used by the applicants are based on accurate and suitable methods (see p. 189, col. 1 of the draft EIS), rather than whether the methods used by the various applicants are comparable.

283. **Comment**: Need to clarify what a further environmental review would mean. Could the board deny development altogether based on further environmental review?

Response: The Board could grant a reservation order conditioned on further environmental review. If, upon further review through an environmental assessment (EA) or EIS, the Board finds that unmitigable costs to society outweigh the benefits of the project, it could modify or deny the reservation.

ALTERNATIVES

284. **Comment**: The Sheridan County Conservation District (SCCD) water reservation application outlines administrative rules intended to establish a sustainable yield (p. 181, SCCD application) for the aquifers and limit development to that level (p. 83, SCCD application). The draft EIS when discussing the Grant All Alternative makes little or no mention of this fact and makes it seem as if SCCD intends to develop all water and thus adversely affect wetland values and wildlife habitat. SCCD's mission is to address all the county's natural resources uses through conservation. Under the Grant All alternative, SCCD intends to adhere to that mission, yet the draft EIS completely glosses over our stated purpose in the application.

Response: DNRC reprinted the administrative procedures from the Sheridan County Conservation District's water reservation application in Appendix I (pp. I-7 through I-15) of the draft EIS. The statement from page 83 of the Sheridan County Conservation District Water Reservation Application reads as follows: "As shown, potential water demand far exceeds water availability. It is therefore the intent of the district to allocate water on a priority basis and to stop development when the threshold between sustained yield and mining is met."

DNRC understands the Sheridan County Conservation District's intent to limit aquifer development to sustainable yield and to consider conservation of all of the county's natural resources. DNRC took these considerations into account when it discussed groundwater impacts under the Grant All Alternative (pp. 120-121 of the draft EIS) and impacts to wetlands (pp. 143-144 of the draft EIS). Still, the SCCD has applied for a large amount of water in its application and, even though the SCCD's intentions may not be to develop all of it, DNRC is obligated under MEPA to address the impacts of the action as proposed. For this reason, portions of the impact analysis may appear somewhat severe, but it was not DNRC's intent to disregard the stated purpose of the SCCD's application.

285. **Comment**: Page 98, Table 5-2 - Please provide information and explanation for the rea-

son, or basis, for inclusion of these specific projects (those listed in Table 5-2) as being reduced or eliminated under the Instream or Combination alternatives. These projects should be given the opportunity to have any information which was used as the basis for inclusion in this table provided for examination.

Response. The criteria used to develop the various alternatives are described on page 91 of the draft EIS. In addition, projects were not included in the Instream Alternative if they would not be economically feasible with the water remaining after instream reservations were granted. Generally, projects had to be economically feasible with water available only 6 years out of 10 to be included in the Instream Alternative (see Table L-1, Appendix L of the draft EIS). Table 3-8 contains details on why individual projects were reduced or eliminated under the Instream Alternative. Table 3-9 explains why individual projects were reduced under the Combination Alternative. Please refer to the maps in Appendix F of the draft EIS for details on vegetation and land use on proposed project land.

286. Comment: Page 98, Table 5-2 - Under the heading Combination Alternative Acreage, need an explanation as to why those projects shown by footnote a were not reduced under this alternative.

Response: The criteria used for developing the various alternatives are described on page 91. Different criteria were used for developing different alternatives. Many projects that were reduced under the Instream Alternative, were not reduced under the Combination Alternative, and vice versa. Projects were reduced under the Instream Alternative where they would damage substantial amounts of riparian habitat and wetlands. These criteria did not apply to the Combination Alternative where projects were only reduced if they had insurmountable land use conflicts--for instance, where the land within a proposed project is already being irrigated.

287. **Comment**: Page 99 - In the text regarding the Coordinated Groundwater Development Alternative, the terms supervisor and commissioner are used interchangeably. Perhaps one term would not be as confusing.

Table 3-8. Projects reduced in size or eliminated under the Instream Alternative

MC-01	Much of the acreage for the north (145-acre) pivot was eliminated because it would remove about 59 acres of riparian vegetation.
MC-06	Acreages for all pivots were reduced because they would remove about 235 acres of riparian vegetation.
MC-09	The northwest pivot (33 acres) was eliminated and the northeast pivot (29 acres) was reduced because together they would remove about 57 acres of riparian vegetation.
RI-03	The 67-acre pivot was removed, and the 396-acre and 71-acre pivots reduced because they would remove about 434 acres of riparian vegetation.
RI-10	The two east sprinkler systems (34 and 63 acres) were removed and the two west pivots reduced to avoid much of the 291 acres of riparian vegetation that would be removed by the project
RI-11	All pivots except the southeast (98-acre) pivot were reduced to avoid much of the 454 acres of riparian vegetation that would be removed by the project.
RI-12	The 47-acre, 51-acre, 51-acre, 88-acre, 28-acre, 32-acre, and 57-acre pivots were removed. The 66-acre pivot was reduced. Unaltered, the project would remove about 359 acres of riparian vegetation.
CBI-14	The two project pivots were reduced to avoid 18 acres of wooded riparian vegetation
CBI-17	The 214-acre pivot was reduced to avoid 48 acres of wooded riparian vegetation.
CBI-19	The south (237-acre) project unit was reduced to avoid about 80 acres of riparian vegetation
MC-99, RI-05, RI-06, RI-09, CBI-2, CBI-6, CBI-10, CBI-11, VA-01, VA-03, VA-231, and VA-261	These projects were eliminated from the Instream Alternative because they would not be economically feasible with water available only 6 years out of 10. Four years out of 10, water would not be available after DFWP's instream flow requests are satisfied

Table 3-9. Reasons project size was reduced under the Combination Alternative

MC-09:	The 403- and 148-acre pivots were reduced. As designed, these units would irrigate 125 acres of land that is already fully irrigated.
RI-05:	The 222- and 83-acre pivots were reduced. As designed, these units would irrigate about 247 acres that are already fully irrigated.
RI-06:	The 199- and 49-acre pivots were removed. These units would irrigate about 153 acres that are already fully irrigated.
RI-09:	The 246-, 144-, and 129-acre pivots have been reduced. As designed, these units would irrigate about 311 acres that are under existing irrigation.
CBI-01:	The east (87-acre) wheel line and 211-acre pivot have been reduced. As designed, these units would irrigate about 78 acres of land that is already fully irrigated.
CBI-02:	The north (69-acre) wheel line has been eliminated because a county road passes through it.
CBI-06:	The middle (57-acre) wheel line has been reduced to avoid buildings.
CBI-10:	The 111- and 39-acre hand lines have been reduced to avoid a county road.
CBI-11:	The 130- and 128-acre pivots have been eliminated. The land is already being irrigated.
CBI-17:	The 202- and 214-acre pivots and 66-acre wheel line have been reduced. As designed, these units would irrigate about 240 acres of land that is already fully irrigated.
VA-01:	The south (31-acre) unit is already irrigated. Twenty-two acres in the north unit are already fully irrigated.
VA-03:	A 48-acre pivot has been eliminated because a major electric transmission line passes through it. The 93-acre pivot has been eliminated because a county road passes through it.
VA-231:	The east pivots (14, 31, 32, and 64 acres) have been reduced. As designed, these units would irrigate about 120 acres of land that are already fully irrigated.
VA-261:	The 21-acre pivot has been eliminated and the 68-acre pivot reduced. A highway passes through them.

Response: The term has been changed to Committee. See Chapter Two of the final EIS for additional information regarding the Reservation Oversight Committee.

288. **Comment**: The four hypothetical alternatives the DNRC has developed give no consideration to the county's (McCone) past efforts in developing our agricultural economy. For example, our irrigated hay and feed grain base is crucial to livestock and wildlife winter survival. Water-spreading systems that are developed on riparian areas in the county are used to sustain critical range management of summer grazing for livestock and wildlife.

Response: All but the No Action Alternative contain reservations for future irrigation development in McCone County. The Consumptive Use Alternative contains all of the acreage requested by the McCone County Conservation District, and only one requested project has been eliminated under the Combination Alternative. Only under the Instream Alternative has the acreage requested by the McCone County Conservation District been substantially reduced. Please see Table 5-1 (p. 93) of the draft EIS.

DOWNSTREAM STATES

289. **Comment**: If water isn't reserved, will it be claimed by downstream states?

Response: No one can say with certainty whether water unclaimed by Montana will be claimed by downstream states in the future. Nevertheless, one of the primary reasons the Montana Legislature initiated the water reservation proceeding was to ensure against the likelihood of that happening. Montana can best prepare for any negotiation or litigation with other states over Missouri River water by identifying its present and future water needs and legally reserving water in amounts sufficient to meet those needs.

290. **Comment**: By requesting reservations for instream flows DFWP appears to be working for benefit of downstream states. This is wrong.

Response: As described on page 20 of the draft EIS, the purpose of DFWP's water reservation requests is to maintain a minimum flow, level, or quality of water by month and throughout the year to provide habitat for fish and wildlife, to benefit the public for recreational uses, to contribute to and maintain a clean, healthful and desirable environment, and to sustain adequate levels of water quality. As defined under Sections 85-2-102(2)(a) and 85-2-316(1), MCA, and ARM 36.102(3), these purposes are beneficial to Montana.

291. **Comment**: Once the instream flow of the Missouri River leaves Montana, does MDNRC have control over the usage of this water in downstream states? I (Larry Olson) do not believe it does.

Response: No, DNRC has no control over the use of any water leaving Montana.

CORPS

292. **Comment**: A working relationship with the Army Corps of Engineers Master Manual of the Missouri River is critical in addressing the social, economic, and environmental impacts.

The Annual Operating Manual of the Missouri River is also of paramount importance. The two documents are the guiding statements of the Army Corps of Engineers which operates the dams on the Missouri River.

Response: DNRC agrees as to the importance of the Corps' Annual and Master Operating Manuals of the Missouri River. As you accurately pointed out, these two documents represent the guiding statement of the Corps' operation of the entire Missouri River system. Montana, therefore, has a vested interest in ensuring that the needs of the state are adequately addressed in both manuals. To that end, DNRC has played an active role by providing significant comments on the Corps' preliminary draft EIS regarding its operating manuals. As DNRC was preparing its final EIS on water reservations, it was awaiting the Corps' response, which will be published in its draft EIS. The Corps' draft EIS will be released sometime in 1994.

293. **Comment**: The U.S. Army Corps of Engineers has control over the flows through Fort Peck Dam (and subsequently the Missouri River) and they will do what they please (not necessarily entering into any agreements with other interested parties). The Corps, therefore, represents a major variable in the reservation process with far-reaching impacts. The draft EIS does not do much to explain the Corps' current operating procedures.

Response: The Corps of Engineers is a major player in the operation of the Missouri River system and will undeniably play a role in the reservation proceeding. The Corps' current operating procedures are discussed on page 44 of the draft EIS. The Corps is currently reviewing its operating procedures, and these procedures may change as a result. See Chapter Two and Appendix A of the final EIS for additional information regarding the Corps' operating procedures.

294. **Comment**: The EIS in its present form does not fully address the relationship between the State of Montana and the Army Corps of Engineers operation of the Missouri River.

Response: It is very difficult to accurately portray the complex relationship between the State of Montana and the Army Corps of Engineers with respect to the operation of the Missouri River system. Currently, the Corps is performing a major review of its Missouri River operations (in its Master Manual Review process), and Montana, like all other Missouri River basin states, is assisting the Corps in these efforts. Montana will continue to pursue its interests by commenting on the Corps' draft EIS and through other means to address issues related to the Corps' Missouri River operations in Montana. The resolution of these matters is outside the scope of this EIS and the water reservation proceeding as a whole.

PICK-SLOAN

295. **Comment**: The most glaring defect of this EIS is the total lack of mention and/or consideration of the intentions and directives of the Pick-Sloan Act. It is my (Don Iverson) understanding that federal laws are to take precedence over state laws and actions in matters such as these. If the directives of the Endangered Species Act are to be considered in this process, so should those of the Pick-Sloan Act.

Response: Since being passed in 1944, the Pick-Sloan Act and its general provisions have changed considerably. Originally, the Act entitled Montana to 970,000 acres of new irrigation, of which only 7 percent were developed. All remaining acres, which had yet to be irrigated, were deauthorized by Congress by 1964. Montana's original irrigation entitlement, therefore, is no longer valid, and according to the United States Bureau of Reclamation and as evidenced by recent acts of Congress, the likelihood that Montana will receive the benefits from irrigation originally authorized by the Pick-Sloan Act is extremely remote. With this in mind, and in our efforts to quantify the benefits of water impounded by Fort Peck Dam, Montana must consider the alternatives to consumptive uses of water, such as hydropower generation, recreation, and fish and wildlife habitat. These benefits accrue to Montana and downstream states.

296. **Comment**: When Fort Peck Dam was built, Montana was promised (through Pick-Sloan) thousands of increased irrigation acres in exchange for the land lost due to the lake (dam). This has never been realized to date and the DFWP request (if granted) will shut down any future irrigation development. Thousands of acres of farmland (dryland) lie along the river today and is farmed, contrary to what the EIS and DFWP say. They claim most of the land is in sod.

Response: For a discussion about Montana's original irrigated acreage entitlement under the Pick-Sloan Act, please see the preceding response. For further information regarding DNRC's categorization of the acres along the lower Missouri River, please refer to pages 59, 141, 12, and Appendix F of the draft EIS.

297. **Comment**: Page 169, paragraph 2 - One of the justifications for the Pick-Sloan program is to provide subsidized power to irrigation users. It is the contention of the conservation districts that the EIS should not consider downstream power in its cost/benefit analysis as conducted in the DEIS.

Response: When the original Pick-Sloan Act was passed, hydropower generation was not considered one of the primary benefits attributable to the operation of Fort Peck Reservoir. Today, however, hydropower generation and its associated revenues provide the greatest net benefit of any component of the entire Missouri River Pick-Sloan program. Since Montana is part of the grid system which uses Pick-Sloan power to establish its rate base, Montana energy co-ops are among the beneficiaries of Pick-Sloan power. Therefore, consideration of the benefits of hydropower generation, even if at facilities downstream from Montana, is appropriate for inclusion in the EIS.

298. **Comment**: The Pick-Sloan Act was not included as a basis for much of the analysis. Criteria it promotes should be included.

Response: DNRC acknowledges that the Pick-Sloan Missouri Basin Program encompasses flood control, navigation improvement, irrigation, municipal and industrial water development, and hydroelectric production for the entire Missouri River basin. However, the criteria of the Pick-Sloan Program do not govern the scoping of this EIS.

SHERIDAN COUNTY

299. **Comment**: I (Mark Shapley) support in principle the Coordinated Groundwater Development Alternative described in the draft EIS. This alternative has the potential to allow careful development of some additional irrigation water, and at the same time improve the current nonmanagement of the aquifer system in Montana.

Obviously, the reservation must be contingent on the establishment of a controlled groundwater area for these benefits to be realized. It is also critical that the Board of Natural Resources be willing and legally able to delegate decision-making authority over water allocations to the groundwater supervisors described in this alternative.

Finally, the EIS should not promote or appear to promote any particular organization as the appropriate nongovernmental conservation representative on the groundwater commission. The wetlands and lakes associated with the Clear Lake aquifer system have biological importance beyond game waterfowl production. While waterfowl advocates have an obvious stake in water management in the area, it may be equally useful to have broader conservation interests represented.

Under the Coordinated Groundwater Development Alternative, the draft EIS proposes a water commission to administer water use. This proposal needs to explain few minor details as to how and under which rules it will operate. Does a simple major vote rule, 2/3 vote, or full agreement rule? Under what funding source does such a commission work? If each of the diverse interests represented on the commission brings their own funding, do they also not bring implied or stated stipulations along with this money? What exactly is "no substantial adverse effect" and under whose definition of this term does the commission operate?

Response: See Chapter Two of the final EIS for a discussion of options available to the Board under the Coordinated Groundwater Development Alternative. The Board could choose among the options described in Chapter Two and any others that might be stipulated by interested parties if it were to pursue an alternative like the Coordinated Groundwater Development Alternative. At this time, it is unknown what conditions the Board would attach to a reservation.

300. **Comment**: The Sheridan County Conservation District feels the make-up of the Coordinated Groundwater Development Commission as presented in the draft EIS is slanted toward wildlife interests. Ninety-two percent of county land is privately owned and the major economic resource base is agriculture, yet this is not reflected in the commission's proposed composition.

Response: In describing the Coordinated Groundwater Development Alternative, DNRC attempted to provide for a balance of interests on the Committee. Although irrigation projects might be developed on private land in Sheridan County, Committee make-up was dictated by ensuring that parties with an interest in the decision were represented. At least two members of the Committee would represent agricultural interests. Ultimately, the Board will designate the Committee's make-up.

301. **Comment**: The draft EIS needs to consider whether Sheridan County has adequate staff and funding resources to adequately administer and regulate its reservation if granted. The need for a proactive and responsive system of enforcement and monitoring is imperative.

Response: Like any conservation district obtaining a water reservation, the Sheridan County Conservation District (if granted a reservation) would have the authority to tax to ensure that some kind of administrative staff existed to oversee the reservation's management. If requested, technical and financial assistance might be provided by DNRC and other state and federal agencies.

302. **Comment**: Clear authority should be given to the area's Coordinated Groundwater Development Commission to enable it to carry out the protection of wetlands. While we (Montana Audubon Society) applaud the goal of protecting wetlands, we want to make sure that it is a goal that the commission can meet and not just a goal written on a piece of paper.

The Controlled Groundwater Development Commission needs to have the specific authority to consider the biological impacts of any new groundwater development. If there are convincing technical arguments that a new development from an existing water right would be inconsistent with a biologically important wetland, the commission needs to have clear authority to turn down that project. Essentially, the Coordinated Groundwater Development Commission needs to be able to extend its decision making authority beyond existing water rights to include this biological information for the preservation of wetlands. Without this clear authority, the commission could probably be legally challenged if it tried to accomplish the goal of "no substantial adverse effect to wetlands" by turning down a new development from an existing water right. If the only wetlands that can be protected are those with U.S. Fish and Wildlife Service water rights, wetlands in this area will not receive the protection that they need and deserve.

Response. Your comments are noted. In determining that the reservation is in the public interest, the Board must determine whether the expected benefits of applying the reserved water to beneficial use are reasonably likely to exceed the costs, including environmental costs. The Coordinated Groundwater Development Alternative was developed in part as a way to address impacts which cannot reasonably be determined in advance.

303. **Comment**: The 17,479 af/year is a high number to be authorizing under this alternative. Information tells us that this is the high end of the amount of groundwater that might be available in this area. The estimates of available groundwater are "uncertain" at best. In the Westby-Dagmar aquifer, for example, estimates of availability range from 6,330 af/yr (Donovan 1988) to 16,000 af/yr (Sheridan County Conservation District 1991). Yet the draft EIS authorizes 11,179 af/yr. It must be clear that the 17,479 is the high end of what might be available, and not the goal that the controlled

groundwater commission will be trying to reach. Additional data needs to be collected before development of this amount can be authorized. Also, it needs to be made clear in the final EIS that this amount of water can't be developed without the approval of the controlled groundwater commission.

Response: Under the hypothetical Coordinated Groundwater Development Alternative, the Oversight Committee could require that additional data be collected prior to development of the full reservation.

304. **Comment**: The prairie potholes of northeast Sheridan County harbor significant biological diversity in the plants, plant communities, and animals that inhabit this region. In addition to numerous species that are locally uncommon, the area provides habitat for the piping plover (federally listed as threatened), and has in the past been documented as a resting area for whooping crane (federally listed as endangered). This diversity is totally dependent on the hydrology of the area that supports the numerous wetlands and ponds. The Conservation District development would almost surely affect the water table and the regional hydrology of the area. This would in turn bring about a total change in the character and composition of the plants and animals that inhabit this mosaic of upland and wetland habitats.

Response: It is unknown whether the Sheridan County Conservation District would ever fully use the reservation it requested. Its management plan indicates that only a small portion of the water requested would ever be put to beneficial use. If only a small number of irrigation projects are built, the impacts could be considerably less than those described under the Grant All Alternative.

OPINIONS

The following statements represent commenter's opinions to which DNRC is not offering responses.

305. **Comment**: The Instream Flow Alternative should be thrown out. There should be consistency across alternatives presented in the draft EIS.

306. **Comment**: The Consumptive Use Alternative is preferable, based on current information and knowledge.

307. **Comment**: After studying the three alternatives, we (Phillips County Commissioners) advocate the Consumptive Alternative. We believe all water rights, even after 1985, should be senior water rights, junior to each other by application or adjudication date. We do not believe the DFWP's requests for water reservation as presented in the draft EIS should be granted under any circumstances. We would prefer that the DFWP increase the use of their existing water rights lease program for instream flows rather than request reservations.

308. **Comment**: Farmers and ranchers should be given more water rights to continue building more reservoirs.

309. **Comment**: Glacial Prairie wetlands were once common in the United States, but are now quite rare due to agricultural development. Approximately ten years ago I (Peter Lesica) conducted a study of pothole wetlands in Montana for the Nature Conservancy. Most of these wetlands have been lost or degraded. One of the best examples of glacial wetlands with relatively intact prairie vegetation in Montana occurs in Sheridan County. Many of these wetlands have become dry during the past decade due to the prolonged drought. These wetlands are an extremely valuable resource and should not be endangered by pumping of groundwater for any reason. As I understand it, the coordinated groundwater development alternative would protect these wetlands. This is the only sensible alternative.

310. **Comment**: I (Bernhard T. Hall, Nature Conservancy of Montana) have recently reviewed the Lower Missouri River Basin Draft EIS. I would like to express my concern and opposition to granting the Sheridan County Conservation District request for groundwater reservation and development. As a landowner of 1,140 acres in Sheridan County, The Nature Conservancy would be directly affected by a groundwater development of this magnitude.

311. **Comment**: We (Janet Ellis, Montana Audubon Council) support the "Coordinated Groundwater Development Alternative" for the Sheridan County Groundwater Area, with some modifications.

Under this alternative, we support the formation of a controlled groundwater area pursuant to Section 85-2-506, MCA. We also applaud the fact that wetlands are recognized as a critical element that needs protection under this alternative.

312. **Comment**: The Service (USFWS) supports establishment of a controlled groundwater area, which would ensure that any additional development will be within the identified sustained yield. Sheridan County states that the conservation district is opposed to a controlled groundwater area (see Application for Reservation).

313. **Comment**: When the Coordinated Groundwater Development Commission is set up, it needs to be a proactive committee. It should begin immediately to make decisions about the criteria it will use to decide which projects it will accept or reject. These criteria should be subject to public review. Their initial efforts should also be directed towards deciding what new data collection needs to happen so that they can make informed decisions, and then setting up a way for the necessary data to be collected.

314. **Comment**: A final point that we (Janet Ellis, Montana Audubon Council) need to make on the Sheridan County Groundwater Area Alternatives is that we strongly oppose the "Grant All" Alternative. As stated in the "Impacts" section of the draft EIS,"the volume of water applied for greatly exceeds the volume of water estimated to be available from the aquifers." The impact of selecting this alternative would be devastating to lakes and wetlands.

315. **Comment**: Most of us who live in these semi-arid high plains have a benevolent attitude toward the fish, flora and fauna that share their home with us. We (James Halverson, Roosevelt County) believe, as custodians of the land, the residents should have first priority to the water.

316. **Comment**: This document is a glaring example of how little understanding and comprehension there is of the diverse nature of Eastern Montana, its environment, and how its inhabitants survive in its varied and extreme climate.

317. **Comment**: The Board of County Commissioners (McCone County) recommends that instream flow reservations on the Redwater River and Missouri River be reduced or not granted until further study can fully determine our highest and best use of surface waters.

318. **Comment**: We (James Halverson, Roosevelt County) believe that not only have present needs and requirements of our area been ignored, but potential future development of the Lower Missouri River Basin will be compromised if our water is adjudicated as proposed by Fish Wildlife and Parks.

319. **Comment**: The Consumptive Use Alternative is the preferable result in the state's Water Reservation process on the lower Missouri River Basin.

320. **Comment**: I (Milo Mattelin) once heard an older rancher describe water as the lifeblood of the prairies. I believe that we should use as much "lifeblood" in Montana as possible, before we let it flow downstream to generate power or float barges.

321. **Comment**: Appendix I-13: This does not give an adequate explanation as to how the Conservation District will handle enforcement. The Service (USFWS) believes it should be more detailed as to all procedures, forms, evidence, or certification needed to eliminate improper withdrawals and use.

322. **Comment**: We (Janet Ellis, Montana Audubon Council) support the "Instream Alternative" for the lower Missouri River, the Milk River, and the Little Missouri River subbasins. We support this alternative because of the need to be proactive in managing the increasing demands on our water resources. The Instream Alternative would help ensure that habitat destruction and degradation of water quality would be minimal.

This area already is plagued by problems from "intermittent streamflow." We need to set up a public policy that will not exasperate this problem.

323. **Comment**: "In my mind (Marilyn L. Weeks), the Fish and Wildlife Department are being extremely greedy in their request. They remind me of a bunch of school kids trying to put something over on the school principal. I hope good judgement and common sense will prevail. Birds, fish and weekend hunters are important, but farmers and ranchers are the life blood of our countryside.

324. **Comment**: Granting instream flow reservations in this basin effectively loses water development in the lower Missouri River basin. The water reservation process should address our needs in Eastern Montana, not just instream flow requests by the DFWP and recreationists.

325. **Comment**: The amount of water necessary for developing our resource base should be the

most important consideration in understanding the future impact of not being able to appropriate water and putting it to a beneficial use for future generations.

326. **Comment**: I (Peter Lesica) believe that the EIS did a good job of addressing the vegetation issues involved with allocating water for irrigation. Allowing increased irrigation will jeopardize native plant communities. Some of these, such as hardwood draws, are critical habitat for many species and should be protected. With huge stockpiles of grain and the government paying farmers to take land out of production, it seems insane to want to create more agricultural land from native grasslands. The Instream Alternative appears to make the most sense to me.

327. **Comment**: To summarize, I (Peter Lesica) favor the Instream Alternative for the lower Missouri River and the Coordinated Groundwater Development Alternative for the Sheridan County Groundwater Area. Thank you for giving me this opportunity to comment.

328. **Comment**: Page 169, General Impacts and Considerations and Impacts to Hydroelectric Power Production - The EIS states reservations for proposed consumption uses could affect electric power production by decreasing flows through hydroelectric generating facilities. We don't agree with using downstream flow in the economic analysis. The economic impact of downstream states isn't a consideration for Montana water reservations.

329. **Comment**: When I (Marylyn L. Weeks) look some 35 miles to the southeast of us and see the total irrigation along the Yellowstone River, I wonder why the landowners along the Missouri River should be penalized. Our problem is, we were slow getting geared up for irrigation.

330. **Comment**: I'm (George Budak) writing you this letter to protest the way you held the meetings on the water allocation on Missouri River below Fort Peck Dam. I believe that we are going to take action to see if we can correct the matter. You are taking too much water. The farm land is more important to our future.

331. **Comment**: I (Doug Smith, Bainville) am offended that I must take my precious unpaid time particularly at this time of year to do DNRC's job. As past Chairman of the Missouri River Development Group it really galls me to see DNRC take such a position as you are leaning toward in this EIS. I attended meeting upon meeting where I watched Karen Barclay stand up for Montana's rights and blast the Corps of Engineers for allowing Montana's precious water flow downstream.

332. **Comment**: Of the alternatives described, the Coordinated Groundwater Development Alternative would most likely be the least disruptive. It still leaves many questions unanswered that would need to be quantified through hydrologic study. The sustained yield of the regional aquifers is only estimated and would need to be further quantified before any reservations were granted.

333. **Comment**: I (Milo Mattelin) am deeply concerned and troubled by the anti agriculture-irrigation slant of the lower Missouri River draft EIS.

334. **Comment**: Montana, Its Water and the Doctrine of Prior Appropriation were topics that I was privileged to hear Judge W.W. Lessley lecture the IMnE 331 class about during spring quarter 1972 at MSU. He posed this question: "Montana is the Treasure State. What is Montana's greatest treasure?" He answered, "Montana's greatest treasure is her water." Naturally, he was right and his words ring true today. We must strive to preserve Montana water for beneficial use in Montana.

335. **Comment**: In general, the draft EIS appears to provide an adequate overview of the selected alternatives which were chosen and to fulfill the statutory provisions of the Montana Environmental Policy Act.

CHANGES AND ADDITIONS TO THE DRAFT EIS

In the following section, changes are made to the draft EIS in response to public comments. Comments pointing out incorrect statements in the draft EIS are followed by an excerpt from the draft EIS showing the corrections. Incorrect language has been crossed out and new language is shaded.

336. **Comment:** Page S-7, column 1, paragraph 4 - The paragraph states the Virgelle Diversion was approved during the upper basin reservation proceeding. In fact, only the water reservation for the Bureau of Reclamation was approved, not the diversion itself.

Response: The paragraph referred to has been changed as follows.

> If the Virgelle Diversion--for which BUREC's water reservation was approved during the upper basin reservation proceeding--is not constructed and Canadian and Indian water entitlements are fully developed in the future, a significant reduction in flow of the Milk River would occur. Under these conditions, chemical concentrations (salinity) of the Milk River would increase to the point that water is unsuited for irrigation use. Physical water quality may further decline with increases in temperature and turbidity and a reduction in dissolved oxygen. Concentrations of cadmium, iron, lead, and manganese in the Milk River at Nashua would approach or exceed the public drinking water standard more frequently.

337. **Comment:** Page 5, column 2, under Water Leasing for Instream Flows - The 1989 Legislature authorized the pilot water leasing program. Amendments to the original legislation were made in both 1991 and 1993. The first sentence is not clear on that point.

Response: DNRC changed page 5 as follows.

WATER LEASING FOR INSTREAM FLOWS

> The 1989 ~~and 1993~~ legislature authorized DFWP to lease existing water rights for instream flows (§ 85-2-436, MCA) as part of a study program. The legislature amended the original bill during the 1991 and 1993 sessions. The purpose of the legislation is to examine the feasibility of leasing existing water rights to maintain and enhance streamflow for fisheries. This 10-year pilot program allows DFWP to lease water from willing water right holders to no more than 20 stream reaches. To date, DFWP has entered into two leases, both for flows in Mill Creek in the Yellowstone River basin.

338. **Comment:** Page 23, Map 3-7 - The designated reach for Beaver Creek (Phillips County) should extend to the creek's mouth.

Response: Map 3-7 has been updated (see next page).

339. **Comment:** Page 24, Table 3-3, states that Hill County Water District is requesting water from the Marias River. The document further indicates on page 123, Milk River Subbasin, that Hill County also requested water from the outlet works of Fresno Reservoir. The Notice of Application dated February 2, 1994, does not indicate that Hill County requested a reservation from the Milk River at the outlet of Fresno Reservoir.

Response: DNRC made a mistake in the February 2, 1994, notice and on Table 3-3 of the draft EIS. The Hill County Conservation District has requested a reservation for 110 af/yr from the Marias River, and 542 af/yr to be diverted into storage from the outlet works of Fresno Dam between September 30 and June 15 of each year. Changes have been made to Table 3-3 (see next page).

Map 3-7. Location of instream flow requests in the Milk River subbasin

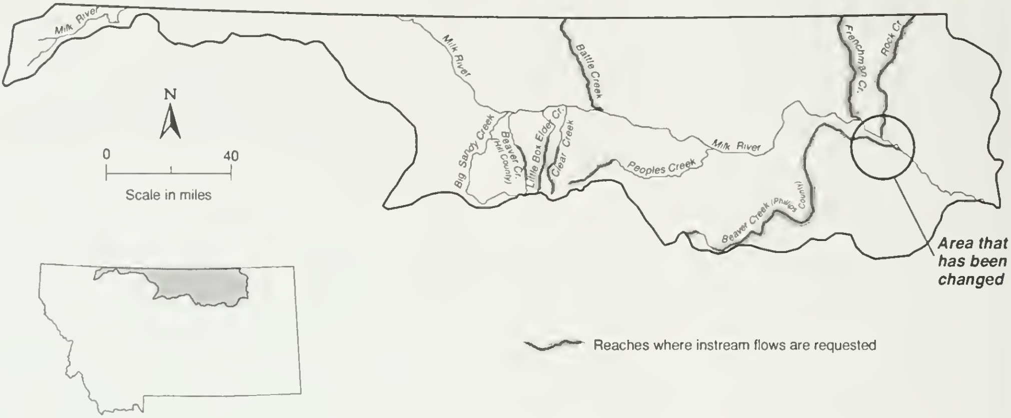

Table 3-3. Reservation requested by municipalities

Municipality	Source	CFS	----Amount---- AF/Yr
Chinook	(1) well	0.73	200(2)
Milk River	[b]	600	
Circle	well	0.57	78
Culbertson[a]	Missouri River	0.62	365
Ekalaka	wells	0.10	20
Fort Peck	Missouri River	0.30	100
Harlem	(1) well	0.73	200(2)
Milk River	[b]	365	
Havre	wells	2.2	475
Hill Co. Water Dist.	Marias River	[b]	652
	Milk River(Fresno Dam outlet)	[b]	542
Malta	well	0.63	137
Plentywood	well	1.04	235
Poplar	well	2.08	448
Scobey	well	1.04	448
Wibaux	well	0.42	70.6
Wolf Point	wells	2.1	504

[a] Also includes water for proposed water and sewer district

[b] No peak flow rate request

SOURCES: Chinook 1991; Circle 1991; Culbertson 1991; Ekalaka 1991' Fort Peck 1991; Harlem 1991; Havre 1991; Hill County Water District 1991; Malta 1991; Plentywood 1991; Poplar 1991; Scobey 1991; Wibaux 1991; Wolf Point 1991

340. **Comment:** Page 27, paragraph 5 - Irrigation releases from storage in the Milk River and below Fort Peck actually increase monthly flows during the irrigation season. This analysis should be brought out in this paragraph of the EIS.

Response: During the irrigation season, releases from storage for irrigation will tend to increase streamflows between the reservoir and the point of diversion. Downstream from the point of diversion, streamflows will tend to be reduced during the irrigation season.

The draft EIS is changed as follows.

> Natural flow patterns are altered by human activities--primarily irrigation, reservoir operations, interbasin diversions, and to a smaller degree, municipal water use. Figure 4-1 illustrates water consumption by the major water uses in the subbasin....
>
> ...On the average, approximately 25 percent of the water diverted in this portion of the Missouri River basin is used by crops or noncrop plants, or lost to evaporation or percolation into deep aquifers (Soil Conservation Service 1978). The remaining 75 percent of the diverted water returns to the system as surface and groundwater return flows.
>
> Interbasin diversions can greatly alter natural streamflow patterns. Although the Canadians can divert water between Battle Creek and Frenchmen Creek in the Milk River basin, the largest alteration in the study area is due to supplemental water supplied to the Milk River via the Saint Mary's Canal.
>
> Municipalities alter streamflows in much the same way as irrigation except that water is used year-round. Demands increase during the summer because of lawn and garden watering. According to information in the municipal water reservation applications ~~(Aquoneering 1991)~~, approximately 15 percent of the water diverted is consumed by evaporation or other processes, and lost to the system. Water that is not consumed, such as return flows from irrigation of parks and lawns, and water that leaks from distribution pipes, may eventually return to a stream. Water that has been routed through the sewer system also will return to the stream or aquifer after treatment.

341. **Comment:** Page 29, Milk River Subbasin, states that the combined storage capacity of Fresno and Nelson reservoirs is 208,286 acre-feet. The stated storage capacity of the two reservoirs is correct if you intend to refer to the original capacity. Fresno Reservoir was resurveyed in 1978 and the capacity was determined to be 103,397 acre-feet (102,853 acre-feet active storage). In addition, Nelson Reservoir capacity is 79,224 acre-feet with 18,650 located below the outlet works. The total current active storage of Fresno and Nelson Reservoirs is then 163,427 acre-feet. The current active storage of the two reservoirs is about equal to the average annual flow at Havre gaging station, excluding St. Mary water, as listed in Table 4-1.

Response: The EIS is changed as follows.

> ## MILK RIVER SUBBASIN
>
> The Milk River drains over 22,000 square miles in Montana and Canada. For most of the twentieth century, however, the existing flow pattern has been predominantly controlled by water imports from the Saint Mary River basin, reservoir storage, and irrigation. Before that

> time, natural flows in the Milk River were typically erratic, and dominated by runoff from prairie snowpack and sporadic summer rainstorms. Nearly half of the average annual flow at Havre during the irrigation season is contributed by the Saint Mary Canal (Table 4-1) to supply water for some of the 140,000 acres of irrigated land in the Milk River drainage. Fresno and Nelson reservoirs also are used to regulate flows for irrigation. The combined active storage of these two reservoirs is 208,286 acre-feet (BUREC 1981), ~~substantially more than~~ about the same as the average annual flow at Havre, if imports from Saint Mary Canal are excluded.

342. **Comment:** Page 29, Table 4-1 - The table heading for Mean Annual Flow is not correctly aligned.

Response: The table has been realigned.

Table 4-1. Average annual flow in the Milk River subbasin

Station	Mean Annual Flow (acre feet)
Milk River at Havre[1]	300,800
Saint Mary Canal[2]	140,457
Milk River at Nashua[1]	477,500

[1] USGS 1993
[2] DNRC 1977

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343. **Comment:** Most of the graphs and tables showing average monthly or annual streamflow do not identify the period of record used to determine the average. This information is important when comparing averages listed in the published document with averages calculated from longer or shorter periods of historic data, or model data.

Response: Figure 4-2 has been changed as shown on following page. Figure 4-6 - Source should read as changed in the EIS.

344. **Comment:** Page 34, Geologic Setting, paragraph 4 - The term "considerable detail" is misleading in that glacial aquifers are complex and considerable study and data collection are necessary to assess impacts to specific wetland units.

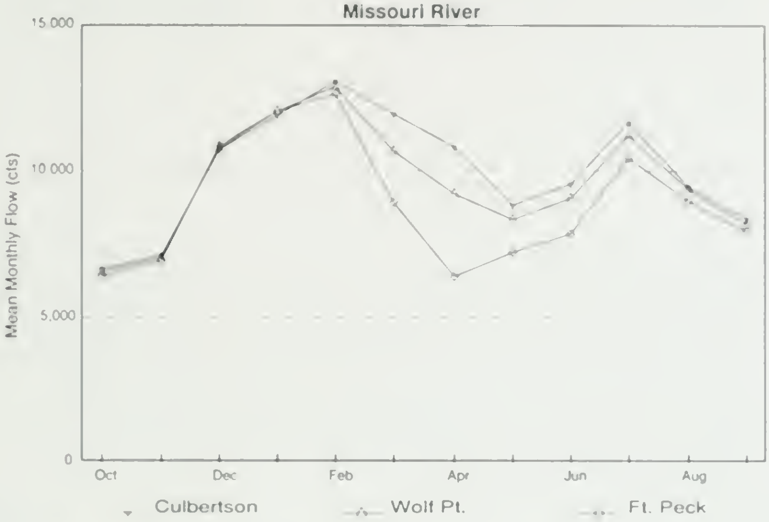
Page 34, paragraph 1, Water Use - This paragraph is a description of water use in Montana but does not attempt to estimate the water use in the North Dakota portion (Skjermo Lake aquifer) of the aquifer, which has a number of irrigation systems pumping out of the same aquifer. Preliminary information indicates this aquifer is fully appropriated and effectively closed to new permits.

Response: The Geologic Setting section has been changed as follows.

> The major aquifer system formed by the channel deposits has been studied ~~in considerable detail~~ by the Montana Bureau of Mines and Geology (MBMG) (Donovan 1988) and the USGS (Levings 1986).

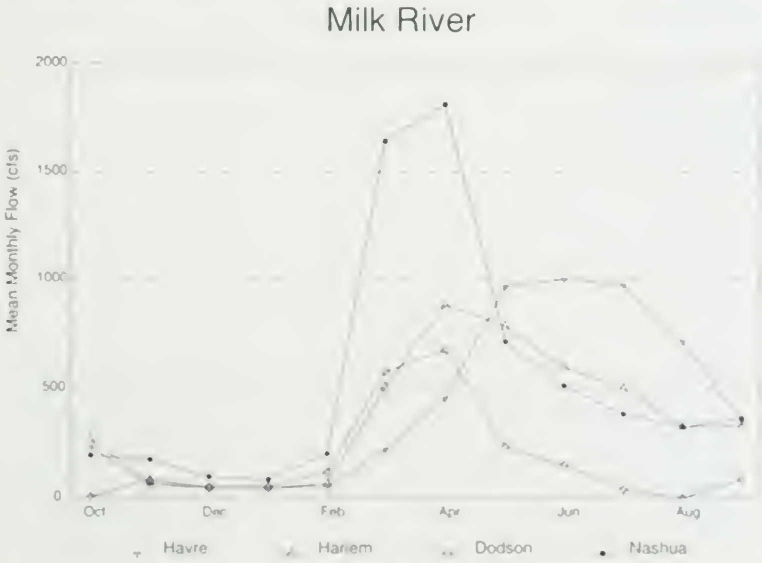
The Water Use section that appeared on page 34 of the draft EIS has been changed to incorporate your comments.

Figure 4-2. Average monthly flows for the Missouri River below Fort Peck Dam



Source: from USGS extended flow data (1928-1986)

Figure 4-6. Average monthly flows for the Milk River



Source: results of DNRC Milk River Model, existing conditions (1928-1986)

WATER USE

> MBMG calculated the volume of water pumped from the Westby-Dagmar channel in Montana for irrigation in 1984 to be 5,275 af. The annual average volume from 1983 to 1988 was estimated at 4,821 af (Donovan 1988). In 1988, the calculated usage was 6,025 af, the highest volume used up to that date. The total annual volume permitted by DNRC for high yield irrigation wells in both the Westby-Dagmar channel and the ancestral Missouri terrace gravel east of Big Muddy Creek as of February 1993 was 8,126 af. This area has 26 irrigation systems ranging from 123 to 250 acres. Wells that supply water for these irrigation systems are largely situated on the Westby-Dagmar channel although one or two are in the ancestral Missouri terrace gravel. Generally, permitted volumes are greater than the volumes actually used. According to annual reports prepared by the North Dakota State Water Commission (NDSWC) (Wanek 1990), there are an additional 24 pivot irrigation systems in the Skjermo Lake aquifer, which is the continuation of the Westby-Dagmar channel into North Dakota, in the vicinity of Westby. Reported withdrawals of groundwater for irrigation from the Skjermo Lake aquifer in North Dakota were 4,672 af in 1988 and 2,784 af in 1991. The 1991 use appears to be near average for the period 1981-1991 based on the water use graph included in the NDSWC 1990 Skjermo Lake aquifer update (Wanek 1990).

The appropriation status of the Skjermo Lake aquifer is discussed on page 36, column 1, last paragraph of the draft EIS.

345. **Comment:** The draft EIS should identify areas of groundwater recharge and more closely define the relationship of the aquifer to its surface expression of wetlands and lakes. A statement emphasizing the stratigraphic complexity of glacial aquifer systems should be included under geologic setting. The draft EIS tone seems to imply a homogenous consistency throughout the aquifer. Water quality varies widely throughout the Dagmar Westby aquifer. Changing groundwater flow paths induced by pumping may cause water quality to become degraded, affecting limnological and biological components critical to wetland habitats.

Response: The variability of water quality in the Westby-Dagmar aquifer and the effects of pumping on groundwater flow paths is discussed on page 131 of the draft EIS. Concerning the relationship of the aquifer to the surface waters, see response to comment 217b. The following information has been added to the discussion on page 34.

> The glacial aquifers in Sheridan County form a complex aquifer system. The various aquifers are known to connect or not connect to one another in some locations, while it is unclear how they may be related in other locations. In a context of aquifer management, it is useful to use the term "aquifer system" to refer to all of the major outwash and terrace gravel aquifers in southeastern Sheridan County, shown in Map 4-1.
>
> The complexity of the aquifer system cannot be overemphasized. Glacially deposited materials are typically highly variable both laterally and vertically. Existing cross-section views of the Westby-Dagmar channel aquifer (Donovan 1988, Sheet 3) based on drill hole data indicate highly variable conditions with depth, along lines of cross-section, and from one cross-section to others nearby. Except in areas where wells or test hole data are closely spaced, the subsurface conditions are uncertain or unknown. Well logs from isolated locations must be interpreted

> cautiously, as conditions at other nearby locations could be completely different. Nevertheless, the observed groundwater gradient in the channel from Westby to Big Muddy Creek indicates that some overall hydraulic connection exists within the Westby-Dagmar aquifer.

346. **Comment:** Page 36, paragraph 1, last sentence - Water is not slowly released from refuge lakes or drawn down to make room for water the next year. This has and will happen when abundant water supplies are available, but has not taken place in several years.

Response: The EIS is changed as follows.

Medicine Lake, Homestead Lake, and other smaller lakes in the vicinity are managed by USFWS as components of the Medicine Lake Wildlife Refuge. The lakes receive spring runoff from major tributaries, and USFWS diverts spring runoff to the lakes from Big Muddy Creek if runoff is available. During ~~the~~ summers when abundant water supplies are available water is released slowly from the lakes, and~~. The~~ lakes are drawn down late in the year to make room for runoff the following spring. According to USFWS, this has not taken place in several years (Webster 1994).

347. **Comment:** Page 36 - Analysis of the understanding that water levels are trending upward this spring should be included in the draft EIS. This is important data which should be included in the water graphs.

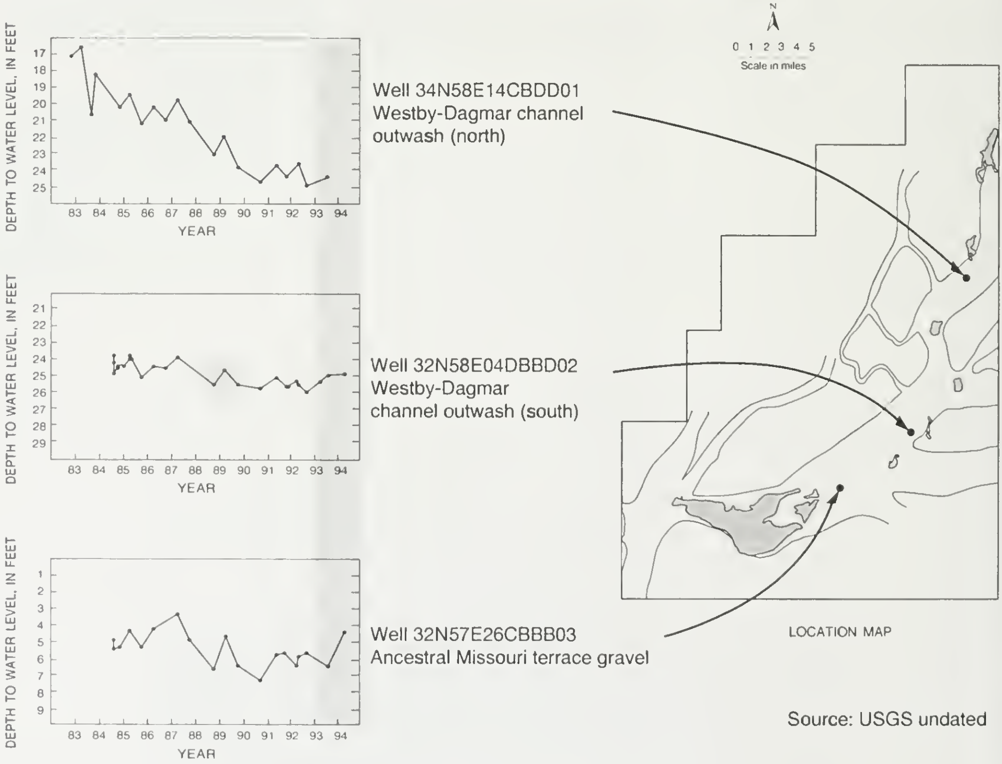
Response: DNRC evaluated observation well measurements available from the Montana Bureau of Mines and Geology and the U.S. Geological Survey at the time the draft EIS was written. The most recent data available at that time were for spring 1993. Provisional data are now available from the U.S. Geological Survey for fall 1993 and spring 1994. Until DNRC analyzes these data, it cannot make conclusions on water level trends in area aquifers. However, water levels in the three observation wells shown in Figure 4-8 on page 37 of the draft EIS have been updated, changes have been made in the text describing the hydrographs in Figure 4-8, and a paragraph has been added to discuss the possible episodic nature of recharge to the aquifer and possible implications of water level changes that could be occurring now or in the future. Changes to the EIS are as follows.

> Hydrographs in Figure 4-8 illustrate general groundwater level trends in the northern portion of the Westby-Dagmar channel outwash (top), the southern portion of the Westby-Dagmar outwash (middle), and the ancestral Missouri River terrace gravels (bottom). ~~Based on d~~Data from eight USGS observation wells~~,~~ indicate groundwater levels in the Westby-Dagmar channel north of Clear Lake declined about 6 to 9 inches a year between 1982 and 1990. Measurements since 1990 indicate groundwater levels in the northern portion of the Westby-Dagmar channel have generally remained at about 1990 levels, with little or no further decline through the fall of ~~1992~~ 1993.
>
> Declines in groundwater levels measured in observation wells in the Westby-Dagmar channel south of Clear Lake and in ancestral Missouri River terrace gravels were 2 feet or less between 1982-1992. It may be that the maintenance of water levels in the USFWS lakes by importing water from Big Muddy Creek tends to stabilize groundwater levels in the southern portion of the Westby-Dagmar channel outwash to some extent..
>
> ...Above normal annual precipitation in Sheridan County in 1991 and near normal precipitation in 1992 occurred largely as late spring and summer rain. This precipitation was largely soaked up by soil and did

not produce much runoff. This benefitted crops but provided little relief to the low water in the Medicine Lake National Wildlife Refuge.

Donovan (1988) noted that the historical record of climatic fluctuations suggests that basin recharge may be episodic, with recharge to the Westby-Dagmar aquifer occurring irregularly and in large volume. Slight to moderate water level recoveries occurred in many wells during a relatively wet period in 1986-1987, and such recovery might have been occurring in 1993 (Figure 4-8).

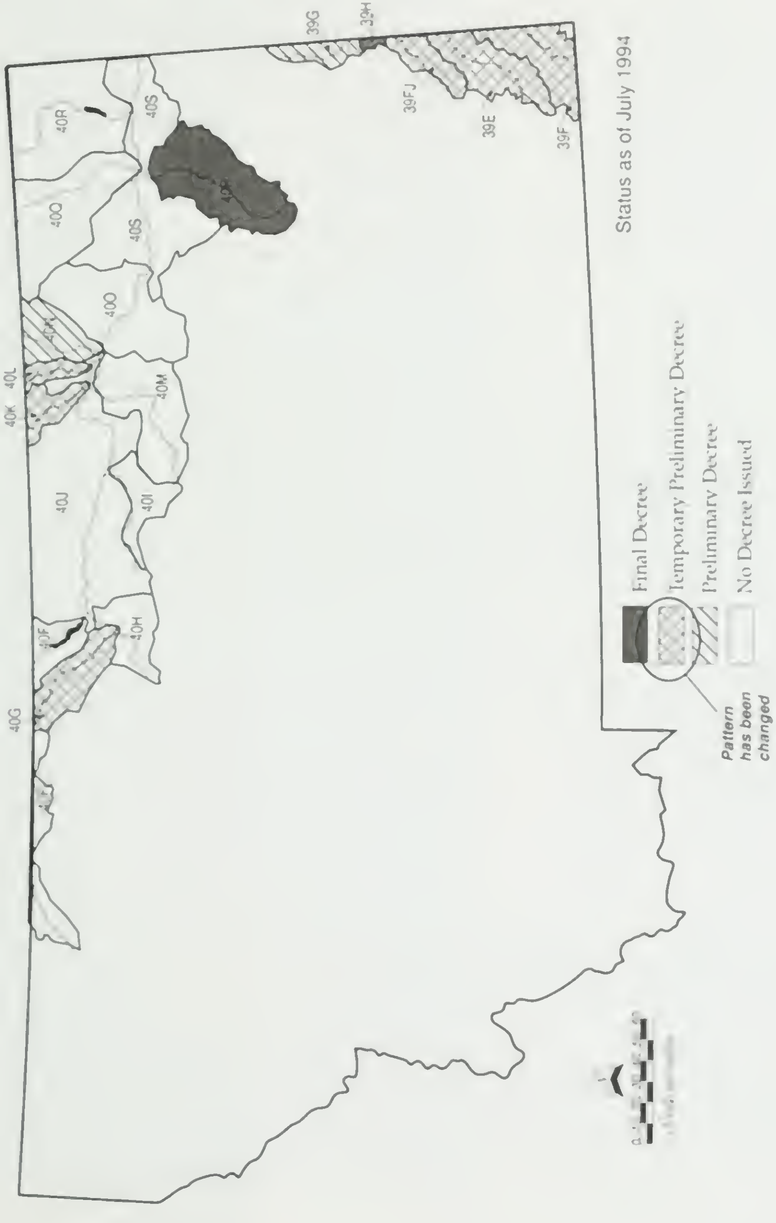
Figure 4-8. Water levels in selected wells in unconsolidated aquafers, 1982-~~1993~~-1994



Source: USGS undated

348. **Comment:** Page 38. Map 4-2 - Need a better designation of basins where temporary preliminary decrees and no decrees have been issued. They both look alike.

Response: Map 4-2 has been changed.



Map 4-2. Status of Water Rights Adjudication in the Lower Missouri Basin

349. **Comment:** Page 46, paragraph 6 - The numbers are missing for toxicity to plants.

Response: A typographical error omitted the toxicity level of selenium in plants. The following change has been made:

> **Selenium:** Throughout much of geologic history, volcanic activity has been the main source of selenium in rock and soil materials. Weathering of Cretaceous shale deposits is the major source of selenium in the environment at present. Selenium is a relatively uncommon element essential to humans in very small concentrations. It is toxic to plants in concentrations as low as 25 ppm. EPA has established ambient water quality criteria for freshwater aquatic life ranging from 20 ppm (short-term exposure) to 5 ppm (long-term exposure).

350. **Comment:** Page 51, paragraph 4, Big Muddy Creek - Water is not slowly released from refuge lakes or drawn down to make room for water the next year. This has and will happen when abundant water supplies are available, but has not taken place in several years.

Response: The EIS has been changed as follows.

> Many of the lakes in the Lake Creek tributary are within the Medicine Lake Wildlife Refuge and managed by the USFWS for wildlife enhancement and waterfowl production. Maintenance of adequate water quality in the lakes is an important part of the USFWS management program, and lakes are flushed with surface runoff and surface inflows whenever possible (Donovan 1988). For example, spring runoff from Big Muddy Creek is diverted to fill Medicine Lake and Homestead Lake. ~~Water~~ When abundant water supplies are available, water is drained from the lakes later in the year to provide storage capacity for the next year's runoff.

351. **Comment:** Page 59, Table 4-7 - Footnote d appears to be designated as a b in the table.

Response: Table 4-7 has been changed as follows.

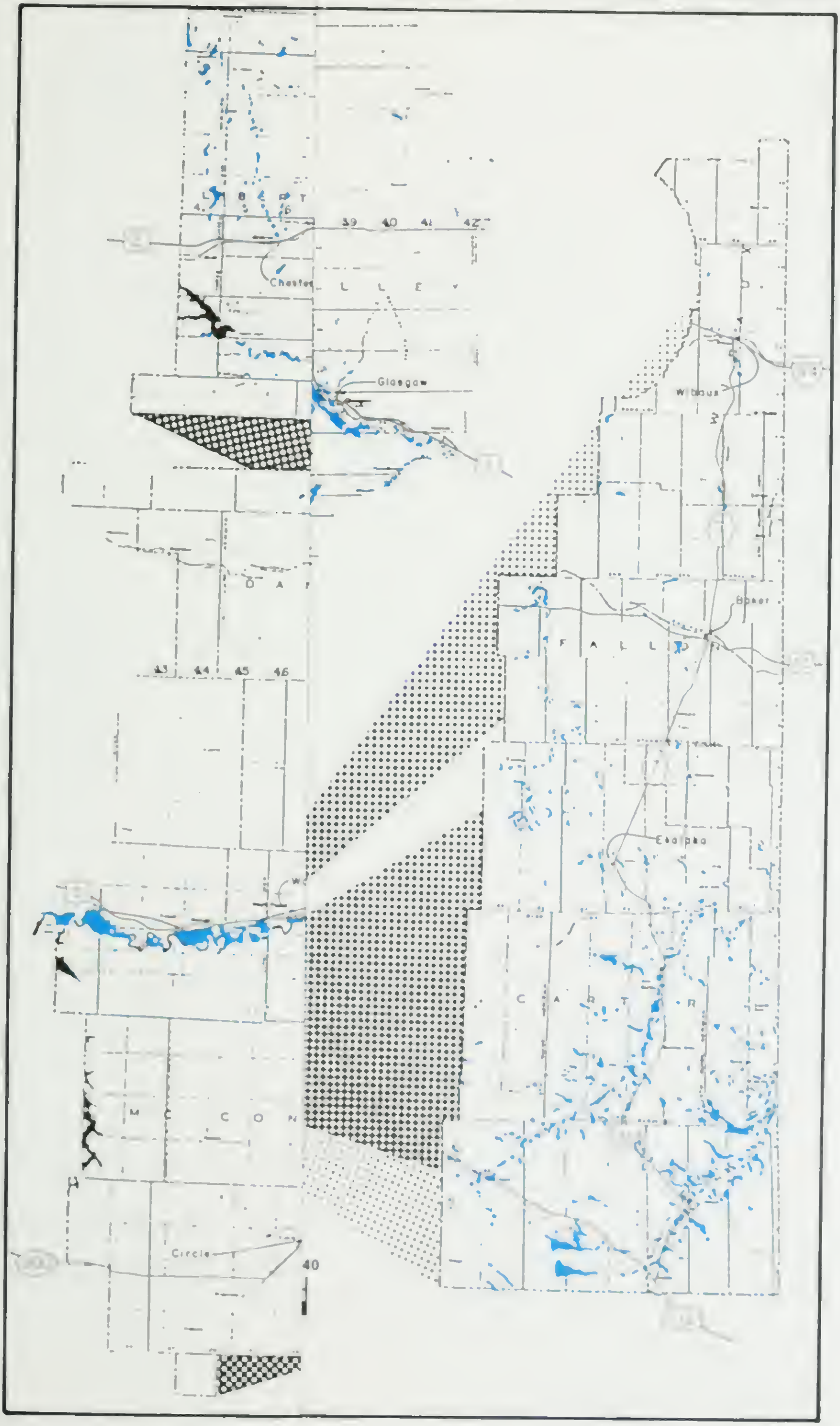
Table 4-7. Vegetation of the Missouri River floodplain below Fort Peck Dam by era (percentage)

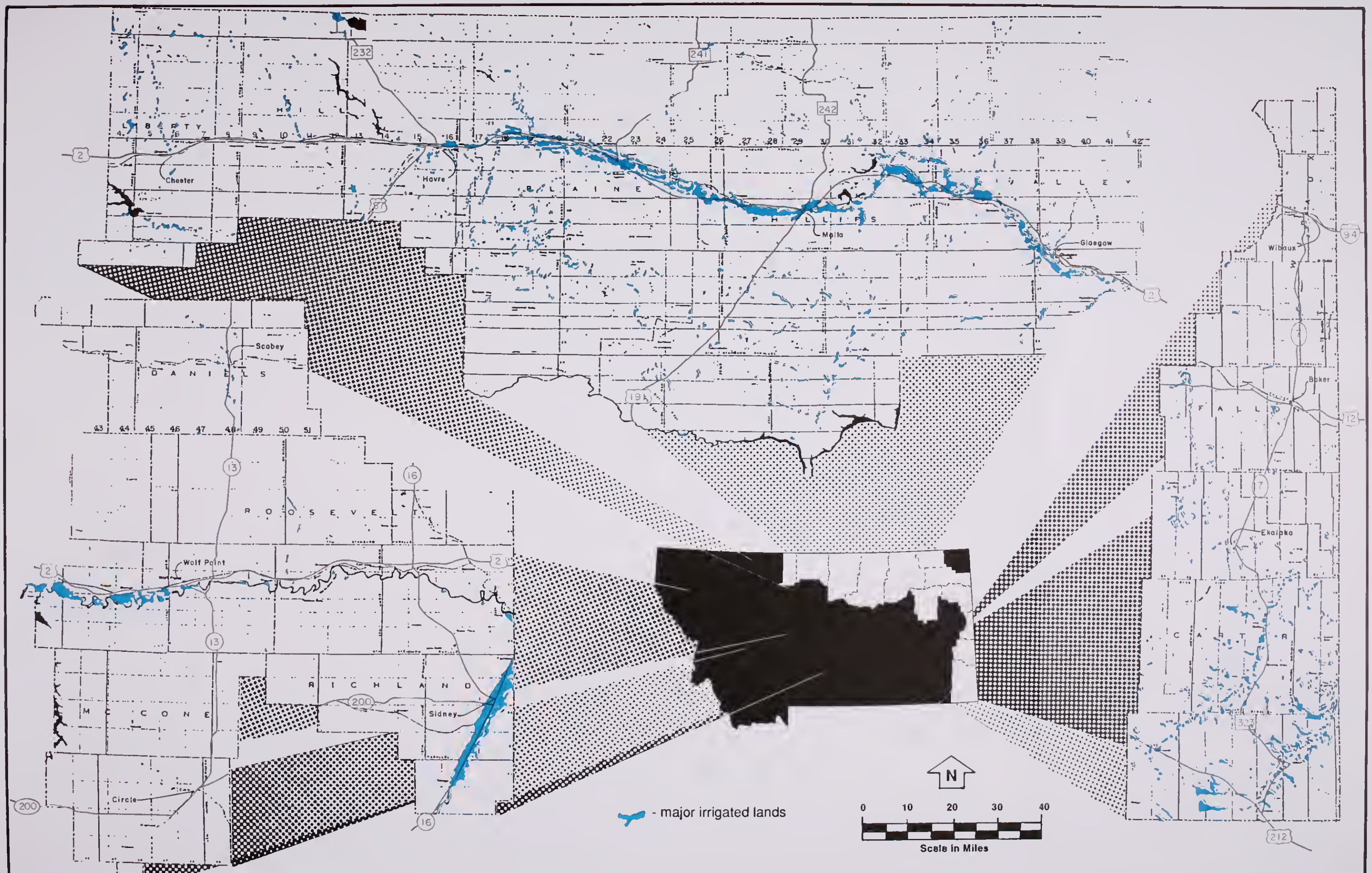
Year	Agriculture[a]	Rights-of-way	Urban/ ranchyard	Woodlands	Shrub scrub	Mixed prairie[b]
1938	24	0.2	0.6	10	14	52
1956	47	0.4	0.9	16	11	25
1974	51	0.5	1.0	20	7	21
1982	55	0.5	0.8	13	5	26
1991	58	[c]	1~~[b]~~[d]	14	5	22

[a] Agriculture includes the irrigated cropland and nonirrigated cropland categories from Table 4-6.
[b] Mixed prairie includes the prairie, mixed prairie, and marsh categories from Table 4-6.
[c] Rights-of-way were not delineated for 1991 data.
[d] Only includes urban land.

352. **Comment:** I (John E. Bloomquist) suggest that the map on page 65 of the draft EIS should be printed on 11 x 17 paper, as this exhibit will be valuable reference in the future. The legibility of the map should be improved.

Response: This map was revised and a corrected version reprinted on the next page.


L I B E R T
4
5
6
39
40
41
42
Chester
L L E
Glasgow
Wibaux
Baker
F A L L O
Ekalaka
C A R T E R
D A
43
44
45
46
M C C O N
Circle
40



Map 4-5. Irrigated Land in the Lower Missouri River Basin

353. **Comment:** Page 66, column 2 - Recent data shows male paddlefish average 25 pounds and females average 60 pounds. Reference: Stewart, P. 1993. Yellowstone River paddlefish investigations. Fed Aid in Fish Restoration Job Progress Report F-46-R-6,.Job 3C. MT Dept. of Fish, Wildlife and Parks. 13pp.

Response: The EIS is changed as follows.

> **Paddlefish:** The paddlefish is another boneless fish native to the Missouri and Yellowstone rivers in Montana (Figure 4-14). The largest paddlefish on record in Montana weighed 142.5 pounds (DFWP 1991), although they average 20 pounds and 50 inches in length (Brown 1971). Recent data show male paddlefish average 25 pounds in weight and females average 60 pounds (Stewart 1993b). During spring runoff, paddlefish migrate from Lake Sakakawea in North Dakota up the Missouri and Milk rivers. A portion of this population migrates up the Yellowstone River (Holton 1986). Spawning has been documented in the lower reach of the Milk River and concentrations of paddlefish have been observed near the confluence of the Milk and Missouri rivers (Holton 1986; Gardner and Stewart 1987). The combination of high, relatively warm turbid water from the Milk River and high flows in the Missouri River are thought to be important in initiating paddlefish migration and spawning (Gardner and Stewart 1987). Paddlefish congregate in the dredge cuts below Fort Peck Dam in the summer and some remain there year-round.

354. **Comment:** Page 68, column 1 - The first sentence under Missouri River Drainage states "most water requests for consumptive and instream reservations in the lower Missouri River sub-basin would take water from the main stem of the Missouri River." Instream reservations do not take water from rivers and streams.

Response: The EIS is changed as follows.

LOWER MISSOURI RIVER SUBBASIN

> **Missouri River Drainage:** ~~Most water requests for consumptive and instream reservations in the lower Missouri River subbasin would take water from the main stem of the Missouri River.~~ In the lower Missouri River subbasin, most of the water sought either for consumptive use or instream reservation is in the Missouri River main stem. The portion of the Missouri River from Fort Peck Dam to North Dakota supports one of the most diverse fish populations in the state of Montana, including five species of special concern. These are the pallid sturgeon, an endangered species; paddlefish; shortnose gar; sicklefin chub; and blue sucker. The Missouri River also supports a wide variety of game fish, including shovelnose sturgeon, walleye, sauger, northern pike, and a host of forage fish (Appendix H). DFWP rates this portion of the river as a Class I stream with outstanding fishery values.

355. **Comment:** Page 70, first paragraph under Sheridan County Groundwater Area - The reference (DFWP 1989) should probably read (DFWP 1989b)

Response: The change is made as follows.

> Most of the projects proposed by the Sheridan County Conservation District would divert groundwater. Groundwater and surface water in this area is directly connected in some cases, so the proposed projects

353. **Comment:** Page 66, column 2 - Recent data shows male paddlefish average 25 pounds and females average 60 pounds. Reference: Stewart, P. 1993. Yellowstone River paddlefish investigations. Fed. Aid in Fish Restoration Job Progress Report F-46-R-6, Job 3C. MT Dept. of Fish, Wildlife and Parks, 13pp.

Response: The EIS is changed as follows.

> **Paddlefish:** The paddlefish is another boneless fish native to the Missouri and Yellowstone rivers in Montana (Figure 4-14). The largest paddlefish on record in Montana weighed 142.5 pounds (DFWP 1991), although they average 20 pounds and 50 inches in length (Brown 1971). Recent data show male paddlefish average 25 pounds in weight and females average 60 pounds (Stewart 1993b). During spring runoff, paddlefish migrate from Lake Sakakawea in North Dakota up the Missouri and Milk rivers. A portion of this population migrates up the Yellowstone River (Holton 1986). Spawning has been documented in the lower reach of the Milk River and concentrations of paddlefish have been observed near the confluence of the Milk and Missouri rivers (Holton 1986; Gardner and Stewart 1987). The combination of high, relatively warm turbid water from the Milk River and high flows in the Missouri River are thought to be important in initiating paddlefish migration and spawning (Gardner and Stewart 1987). Paddlefish congregate in the dredge cuts below Fort Peck Dam in the summer and some remain there year-round.

354. **Comment:** Page 68, column 1 - The first sentence under Missouri River Drainage states "most water requests for consumptive and instream reservations in the lower Missouri River sub-basin would take water from the main stem of the Missouri River." Instream reservations do not take water from rivers and streams.

Response: The EIS is changed as follows.

LOWER MISSOURI RIVER SUBBASIN

> **Missouri River Drainage:** ~~Most water requests for consumptive and instream reservations in the lower Missouri River subbasin would take water from the main stem of the Missouri River.~~ In the lower Missouri River subbasin, most of the water sought either for consumptive use or instream reservation is in the Missouri River main stem. The portion of the Missouri River from Fort Peck Dam to North Dakota supports one of the most diverse fish populations in the state of Montana, including five species of special concern. These are the pallid sturgeon, an endangered species; paddlefish; shortnose gar; sicklefin chub; and blue sucker. The Missouri River also supports a wide variety of game fish, including shovelnose sturgeon, walleye, sauger, northern pike, and a host of forage fish (Appendix H). DFWP rates this portion of the river as a Class I stream with outstanding fishery values.

355. **Comment:** Page 70, first paragraph under Sheridan County Groundwater Area - The reference (DFWP 1989) should probably read (DFWP 1989b)

Response: The change is made as follows.

> Most of the projects proposed by the Sheridan County Conservation District would divert groundwater. Groundwater and surface water in this area is directly connected in some cases, so the proposed projects

> could affect area lakes. Medicine Lake has supported populations of northern pike, but recent harsh winters and low water levels have resulted in fish kills. Gaffney Lake and Lake #12 on the Medicine Lake National Wildlife Refuge do not support fishing due to winter kills (DFWP 1989b). Brush Lake does not support game fish (DFWP 1989b). Most of the lakes in this area are too salty to support game fish.

356. **Comment:** Species of Special Concern - We (the Montana Audubon Council) have one final comment on this document. The Montana Audubon Council is closely involved with wildlife issues in this state. We found your list of "species of special concern" totally inadequate. Flath (1984) is very outdated and incomplete. The Montana Natural Heritage Program (MNHP), which you used for fish and plant information, can also be used for vertebrates. The following species occur in the area under consideration and are candidate species (Category 2) listing as on the Threatened and Endangered Species List by the U.S. Fish & Wildlife Service: Lynx, Northern Goshawk, Ferruginous Hawk, Mountain Plover, Baird's Sparrow, Black Tern, Loggerhead Shrike, and White-faced Ibis. MNHP has given a state and global rank to all of these species, identical to the ratings given for fish. Additionally, all the species that you have listed in Table 4-13 are ranked by the MNHP, so that their status is, in fact, known.

The common names of birds are closely controlled, so when a common bird name is cited, it is as good as the Latin name of the bird. Therefore, everyone will always know that an osprey is an osprey. This does not follow true for mammals, reptiles, amphibians, or any other members of the animal kingdom, however. To enable the public to know what, in fact, a "Dakota Toad" or "Keen's Bat" is, the Latin name must be cited. With the Latin name we can then determine what species, in fact, are located in this area and which ones are sensitive.

Response: Table 4-13 has been revised in response to the comments above.

Table 4-13. Vertebrate species known or suspected to occur in the lower Missouri River drainage

Scientific Name/ Common Name	Global rank[a]	State rank[b]	USFWS status[c]	Subbasin
AMPHIBIANS:				
Bufo hemiophrys Canadian toad	G5	S1	NS	Lower Missouri[d], Milk
REPTILES:				
Chelydra serpentina Snapping turtle	G5	S3	NS	Lower Missouri[d], Little Missouri
Apalone spinifera Spiny softshell	G5	S3	NS	Lower Missouri[d], Little Missouri, Milk
Heterodon nasicus Western hognose snake	G5	S3?	NS	Lower Missouri[d], Little Missouri, Milk
BIRDS:				
Gavia immer Common loon	G5	S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Pelecanus erythrorhynchos American white pelican	G3	S2B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Nycticorax nycticorax Black-crowned night-heron	G5	S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Plegadis chihi White-faced ibis	G5	S2B,SZN	C2	Lower Missouri[d], Milk
Cygnus buccinator Trumpeter swan	G4	S1N,S2B	C2NL	Lower Missouri[d], Milk
Histrionicus histrionicus Harlequin duck	G5	S2B,SZN	C2	Lower Missouri[d], Milk
Haliaeetus leucocephalus Bald eagle	G3	S3B,S3N	LT	Lower Missouri[d], Little Missouri, Milk
Accipiter gentilis Northern goshawk	G4	S4	C2	Lower Missouri[d], Little Missouri, Milk

Scientific Name/ Common Name	Global rank[a]	State rank[b]	USFWS status[c]	Subbasin
Buteo regalis Ferruginous hawk	G4	S3B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Falco peregrinus Peregrine falcon	G3	S1S2B,SZN	LE	Lower Missouri[d], Little Missouri, Milk
Grus americana Whooping crane	G1	SZN	LE	Lower Missouri[d], Milk
Charadrius melodus Piping plover	G3	S2B,SZN	LT	Lower Missouri[d], Milk
Charadrius montanus Mountain plover	G3	S2B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Himantopus mexicanus Black-necked stilt	G5	S3B,SZN	NS	Lower Missouri[d], Milk
Sterna caspia Caspian tern	G5	S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Sterna hirundo Common tern	G5	S3B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Sterna forsteri Forster's tern	G5	S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Sterna antillarum Least tern	G4	S1B,SZN	LE	Lower Missouri[d]
Chlidonias niger Black tern	G4	S3B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Coccyzus americanus Yellow-billed cuckoo	G5	S3B,SZN	NS	Little Missouri, Milk
Speotyto cunicularia Burrowing owl	G4	S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Strix nebulosa Great gray owl	G5	S3	NS	Milk
Tyrannus vociferans Cassins kingbird	G5	S1S3B,SZN	NS	Little Missouri
Lanius ludovicianus Loggerhead shrike	G4	S4B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Mniotilta varia Black-and-white warbler	G5	S1S3B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Passerina cyanea Indigo bunting	G5	S2S4B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
Spiza americana Dickcissel	G4	S1S2B,SZN	NS	Lower Missouri[d], Milk
Amphispiza belli Sage sparrow	G5	SAB,SZN	NS	Little Missouri
Ammodramus bairdii Baird's sparrow	G3	S3B,SZN	C2	Lower Missouri[d], Little Missouri, Milk
Ammodramus leconteii LeConte's sparrow	G4?	S1S2B,SZN	NS	Milk
Icterus spurius Orchard oriole	G5	S2S4B,SZN	NS	Lower Missouri[d], Little Missouri, Milk
MAMMALS:				
Sorex preblei Preble's shrew	G4	S3	C2	Lower Missouri[d], Milk
Sorex nanus Dwarf shrew	G4	S3	NS	Little Missouri, Milk
Sorex merriami Merriam's shrew	G5	S3	NS	Little Missouri, Milk
Myotis septentrionalis Northern myotis (a bat)	G4	S2	NS	Lower Missouri[d]
Plecotus townsendii Townsend's big-eared bat	G4	S2	NS	Lower Missouri[d], Little Missouri
Zapus hudsonius Meadow jumping mouse	G5	S3?	NS	Lower Missouri[d], Little Missouri
Canis lupus Gray wolf	G4	S1	LE	Milk

Known occurrences of species of special concern in the lower Missouri River drainage[e]

Scientific Name/ Common Name	Global rank[a]	State rank[b]	USFWS status[c]	Subbasin
Pelicanus Oertlyrorhynches American white pelican	G3	S2B,SZN	–	Lower Missouri, Milk
Plegadis chihi White-faced ibis	G5	S2B	C2	Milk
Charadrius melodus Piping plover	G3	S2B,SZN	LT	Lower Missouri, Milk, Sheridan County Groundwater Area
Charadrius montanus Mountain plover	G3	S2B,SZN	C2	Milk
Stenna caspia Caspian tern	G5	S3B,SZN	–	Milk
Stenna antillarum Least tern	G4	S1B,SZN	LE	Lower Missouri
Butas regalis Ferruginous hawk	G4	S3B,SZN	C2	Little Missouri
Myotis septantrionalis Northern myotis (a bat)	G4	S2	–	Lower Missouri
Plecotus townsendii Townsend's big-eared bat	G4	S2	–	Lower Missouri
Heterodon nasicus Western hognose snake	G5	S3?	–	Sheridan County Groundwater Area
Opheodrys vernalis Smooth green snake	G5	S3	–	Sheridan County Groundwater Area
Bufo hemiophrys Canadian toad	G5	S3	–	Sheridan County Groundwater Area
Sorex merriami Merriam's shrew	G5	S3	–	Little Missouri
Chaetodipus hispidus Hispid pocket mouse	G5	S3	–	Little Missouri
Zapus hudsonius Meadow jumping mouse	G5	S3?	–	Little Missouri

Rank		
Global[a]	State[b]	
G1	S1	Critically imperiled because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G2	S2	Imperiled because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G3	S3	Either very rare and local throughout its range, or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 to 100 occurrences.
G4	S4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
G5	S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

Other modifiers
B = indicates breeding status for a migratory species
SZN = indicates the status does not apply to birds which are not breeding in Montana

USFWS Status
[c] LT = listed threatened
LE = listed endangered
C1 = Notice of Review, Category 1 (substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened).
C2 = Notice of Review, Category 2 (current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling).
NS = No status assigned.

[d] Lower Missouri River includes Sheridan County Groundwater Area.

[e] Also see pages 70-72 of the draft EIS and response to comment 358.

SOURCE: MNHP 1994

~~Table 4-13. Species of special concern known to occur in Missouri River subbasins~~[a]

~~Species~~	~~Status~~	~~Location in subbasin~~
~~Lynx~~	~~undetermined~~	~~Milk River~~
~~Blacktailed prairie dog~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River~~
~~Meadow jumping mouse~~	~~undetermined~~	~~lower Missouri River, Little Missouri River~~
~~Preble shrew~~	~~undetermined~~	~~Milk River~~
~~Hispid pocket mouse~~	~~rare~~	~~Little Missouri River~~
~~Dwarf shrew~~	~~undetermined~~	~~Sheridan County~~
~~Merriam shrew~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River~~
~~Keen's bat~~	~~undetermined~~	~~lower Missouri River~~
~~Townsend's big-eared bat~~	~~undetermined~~	~~lower Missouri River~~
~~Dakota toad~~	~~undetermined~~	~~Milk River, lower Missouri River, Sheridan County~~
~~Snapping turtle~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Spiny softshell turtle~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River~~
~~Milk snake~~	~~rare~~	~~Milk River~~
~~Plains hognose snake~~	~~rare~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Osprey~~	~~common~~	~~Milk River~~
~~Cooper's hawk~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Northern goshawk~~	~~undetermined~~	~~Milk River, Sheridan County~~
~~Ferruginous hawk~~	~~rare~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Golden eagle~~	~~common~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Merlin~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Prairie falcon~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Upland sandpiper~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Long-billed curlew~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Burrowing owl~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Long-eared owl~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Mountain plover~~	~~rare~~	~~Milk River, lower Missouri River~~
~~Northern saw-whet owl~~	~~undetermined~~	~~Little Missouri River~~
~~Eastern bluebird~~	~~rare~~	~~lower Missouri River, Little Missouri River, Sheridan County~~
~~Dickcissel~~	~~rare~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Clay-colored sparrow~~	~~undetermined~~	~~Milk, lower Missouri, Little Missouri, Sheridan County~~
~~Field sparrow~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Bobolink~~	~~undetermined~~	~~Milk River, lower Missouri River, Little Missouri River, Sheridan County~~
~~Brewer's sparrow~~	~~undetermined~~	~~lower Missouri River, Little Missouri River, Sheridan County~~
~~White-faced ibis~~	~~rare~~	~~lower Missouri River, Sheridan County~~

~~a—Does not include federally listed threatened or endangered species~~

~~SOURCE: Flath 1984~~

357. **Comment:** The draft EIS fails to note that there are 19 waterfowl impoundments around Medicine Lake, with important waterfowl nesting areas around Medicine Lake and on islands.

Response: The following changes are made to the text and Map 4-6.

SHERIDAN COUNTY GROUNDWATER AREA

Sheridan County contains an extensive system of prairie potholes, lakes, and other wetlands (Appendix F), which are extensively used by breeding and migrating shorebirds and other waterfowl. The threatened piping plover nests near some of the saline lakes in the groundwater area. During 1992, 80 percent of the 285 piping plovers in Montana were found in Sheridan County. Within this area, USFWS owns and manages Medicine Lake National Wildlife Refuge and numerous waterfowl production areas and holds many additional easements on wetlands (Map 4-6). Around Medicine Lake there are 19 impoundments managed for waterfowl production. Islands on Medicine Lake and the impoundments and habitat surrounding these lakes provide important habitat for nesting waterfowl and shorebirds.

358. **Comment:** Referring to page 74 - Sheridan County Groundwater Area Medicine Lake, and several other lakes and wetlands attract large numbers of bald and golden eagles during spring and fall migration. During the spring of 1992, 75 eagles used Medicine Lake alone. Peregrine falcons use wetlands during the same period, feeding on waterfowl and shorebirds. The Fish and Wildlife Service has documented sightings every year, demonstrating the importance of this complex of wetlands to these endangered species.

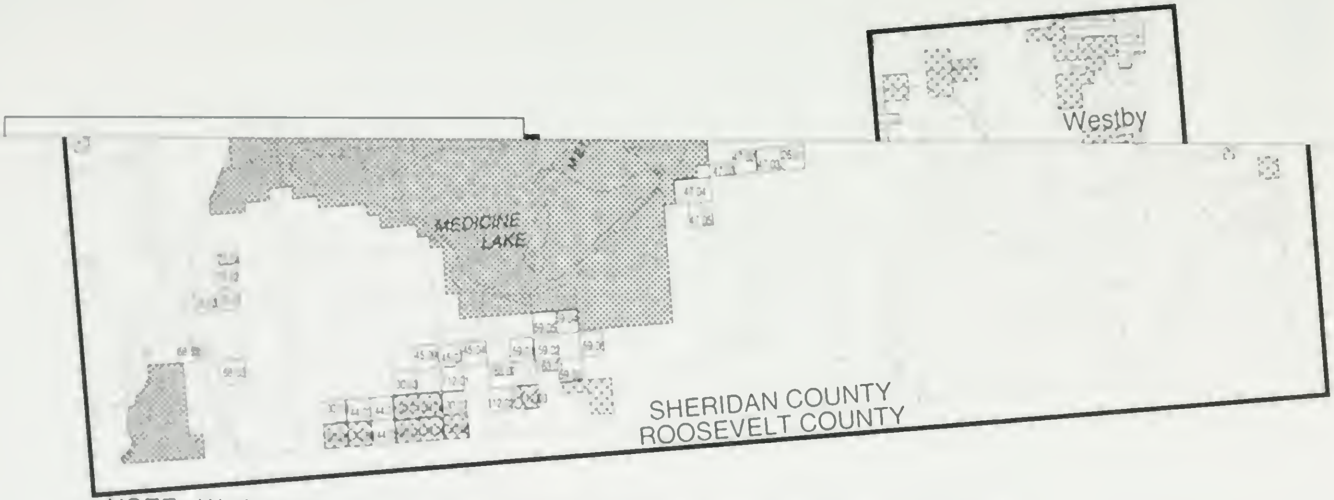
Response: The draft EIS (page 72) is changed as follows.

Bald Eagle: The bald eagle in the lower 48 states has been listed as endangered species since 1978. Recently, however, its status has been changed to threatened. Bald eagles winter on the Missouri River below Fort Peck Dam where open water, an abundance of waterfowl, and the discharge of dead fish through the turbines provide suitable habitat and food (DFWP 1991). There are no recent records of nesting bald eagles on streams where reservations are requested. During the spring and fall migrations, both bald and golden eagles are attracted in large numbers by prey using the lakes and wetlands in the Sheridan County Groundwater Area.

Whooping Crane: The whooping crane is an endangered species that migrates through Montana. It is the largest wading bird in the U.S., standing nearly 5 feet tall with a wing span about 7 feet. Most birds migrating through the study area have been reported from Sheridan County near Medicine Lake National Wildlife Refuge. These birds are thought to be part of a group that nests in the northern part of Canada's Wood Buffalo National Park and winters along the Gulf of Mexico in Aransas National Wildlife Refuge in Texas. The only other group is found at Grays Lake National Wildlife refuge in Idaho (Aderhold 1988).

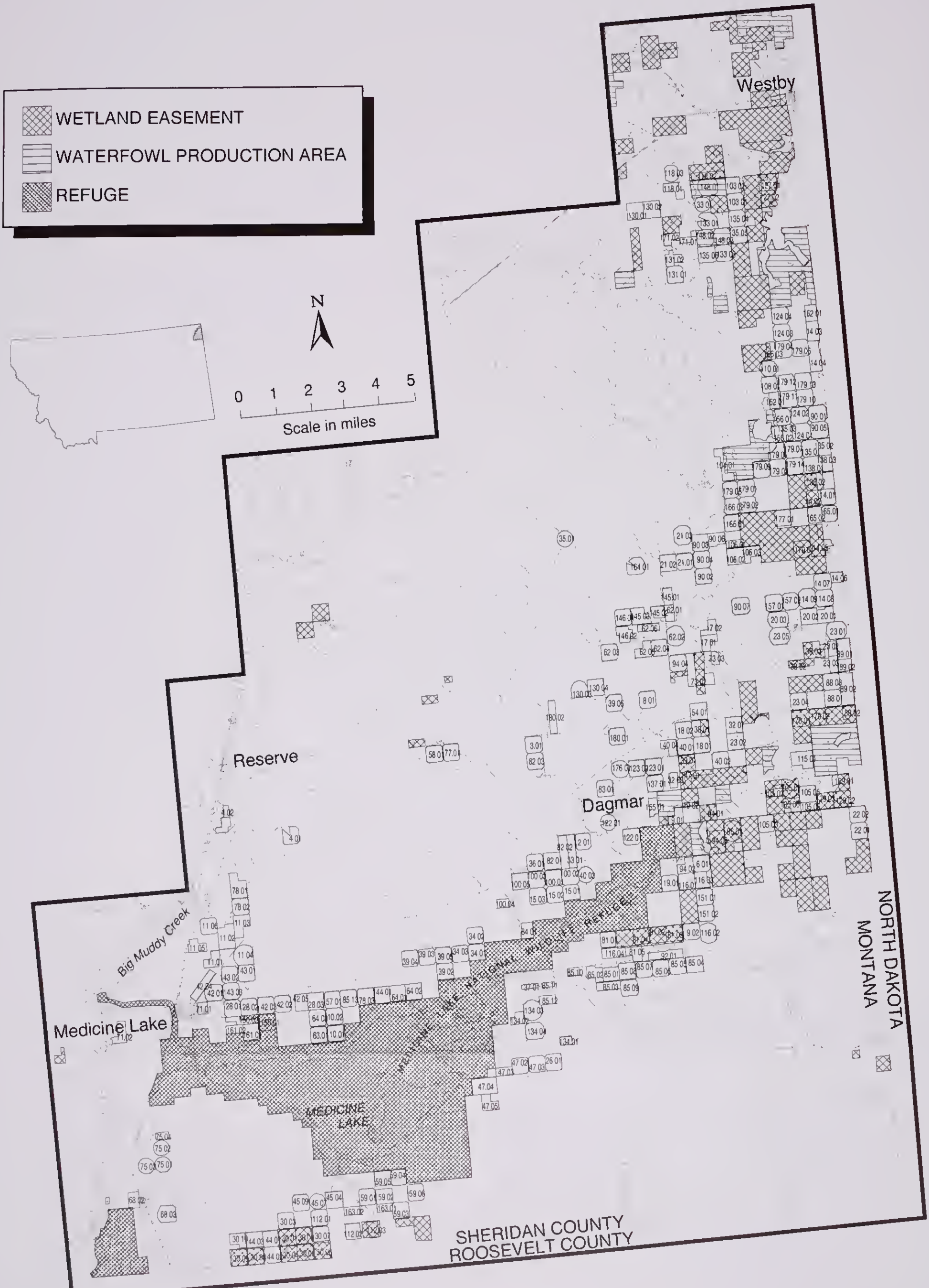
Peregrine Falcon: The peregrine falcon has been listed as an endangered species since 1972. The effects of pesticides on reproduction are among the factors that led to the decline of the peregrine. It migrates through Montana but no longer nests in the area where reservations are sought. Reintroduction efforts have focused on southwestern Montana. Diet of the peregrine falcon consists exclusively of other birds (Aderhold

Map 4-6. Wildlife Lands in the Sheridan County Groundwater Area



NOTE: Wetlands may not be present on all lands where easements are indicated

Map 4-6. Wildlife Lands in the Sheridan County Groundwater Area



NOTE: Wetlands may not be present on all lands where easements are indicated

> 1988). During the spring and fall migrations, peregrine falcons prey on waterfowl and shorebirds using lakes and wetlands in the Sheridan County Groundwater Area.

359. **Comment:** The draft EIS states, "nearly half of the proposed projects are located on land that is not currently cultivated. This land provides habitat for pheasants, white-tailed deer, and red fox. Most of the land appears to be in CRP" (p. 74, col. 2, para. 4). CRP is a government program to temporarily retire cropland, increased wildlife habitat is a temporary benefit of this program. No permanent land use rights were granted away with enrollment, these lands are still considered cropland for tax purposes, USDA programs, and are privately owned. Just because it now temporarily supports wildlife habitat does not mean it should be given greater status as wildlife habitat over cropland. Most CRP land will be returned to crop production, this will happen with or without the granting of a water reservation. If July 1, 1985, is the water reservation priority, and CRP was not even in existence at that time, why are detrimental effects to wildlife habitat even considered? On page 88, column 2, paragraph 5, the draft EIS states "81,560 acres (82 percent) of land proposed for irrigation in this subbasin is under cultivation." Why when talking about wildlife habitat is the term "nearly half" used and in another section "82%" under cultivation used? Isn't this the same land being discussed?

Response: The third sentence that was quoted has been clarified to say: "Most of the uncultivated land appears to be enrolled in the Conservation Reserve Program".~~in CRP.~~ DNRC did not intend to suggest that permanent land use rights were granted or implied after land is no longer enrolled in the CRP program. Your opinion that most land now enrolled in CRP will eventually be farmed is noted. DNRC was trying to characterize the change that different alternatives would bring to present conditions.

The quote in the last part of your comment does not appear on page 88 of the draft EIS; but it is on page 77. The last sentence under Sheridan County Groundwater Area has been deleted as follows.

SHERIDAN COUNTY GROUNDWATER AREA

> As noted in Table 4-15, many of the known sites in this subbasin are associated with the agricultural past of this area. ~~About 81,560 acres (82 percent) of the land proposed for irrigation in this subbasin is under cultivation, limiting the potential for new site discovery.~~

360. **Comment:** Please provide information on how Table 4-17 relates to studies conducted in the lower Missouri basin and show the source for the table.

Response: Table 4-17 shows that in two comprehensive statewide studies, fishing is the most popular water-based recreational activity for adult Montanans. The source for Table 4-17 is shown on page 77 of the draft EIS—McCool and Frost 1987—and has been added to Table 4-17.

Table 4-17. Participation by adult Montanans in 11 outdoor recreational activities - 1979 and 1985

Activity	1979 Percentage participating	1979 Median days	1985 Percentage participating	1985 Median days
Picnicking	77.5	6	74.8	6
Walking for pleasure	71.9	20	77.1	30
Fishing	58.5	14	56.4	12
Camping	57.6	10	51.9	8
Hunting	35.2	10	37.6	10
Bicycling	32.8	20	38.6	20
Motor boating	32.5	6	32.6	5
Bird watching/ nature study	29.4	25	31.8	21
Horseback riding	18.8	10	22.3	6
Snowmobiling	14.8	5	16.3	5
Cross-country skiing	14.6	6	18.6	7

Source: McCool and Frost 1987

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Fishing	58.5	14	56.4	12
Camping	57.6	10	51.9	8
Hunting	35.2	10	37.6	10
Bicycling	32.8	20	38.6	20
Motor boating	32.5	6	32.6	5
Bird watching/ nature study	29.4	25	31.8	21
Horseback riding	18.8	10	22.3	6
Snowmobiling	14.8	5	16.3	5
Cross-country skiing	14.6	6	18.6	7

Source: McCool and Frost 1987

361. **Comment:** Page 94 - The right hand table heading should read Lower Missouri Subbasin--Poplar River Drainage.

Response: The change has been made on the following page.

362. **Comment:** Page 95 - DFWP's reservation request for Box Elder Creek is listed for the purpose of irrigation. This should read instream.

Response: The change is indicated on the following pages.

363. **Comment:** The draft EIS does not adequately address the differences between "adverse effects" and "without harm" when discussing wetlands and existing water users (pp. 98-99). In discussing the Partial Granting and Coordinated Groundwater alternatives, "no adverse effect" and "no substantial effect" are used to make decisions on groundwater development. The Sheridan County Conservation District finds these terms vague and is having a hard time determining which if any of these alternatives should be pursued.

Response: The terms "without adverse effects," "without harm," and "no substantial effect" were used interchangeably on pages 98 and 99 in the draft EIS. It was not intended that these terms have different definitions. This inconsistency has been corrected.

Changes have been made to the Partial Granting and Coordinated Groundwater Development alternatives to clarify the differences between the alternatives and to correct a mistake in the description of the Partial Granting Alternative.

PARTIAL GRANTING ALTERNATIVE

Estimates of the amount of water available in the Westby-Dagmar and associated aquifers vary, based on recent groundwater studies. Under this alternative, the Board would grant the Sheridan County Conservation District a reservation for the amount of water DNRC believes the Westby-Dagmar ~~and associated outwash aquifers~~ aquifer can probably sustain without substantial adverse effects to existing water right holders and wetlands and the amount the associated aquifers might sustain. In this alternative, the more conservative, or low end, estimate of available groundwater in the Westby-Dagmar outwash aquifer is used to minimize the likelihood of substantial adverse effects. Further details on the estimate of groundwater available for the Westby-Dagmar outwash is provided on page 117 of the draft EIS under Estimated of Available Groundwater.

Little information is available to determine how much water is available from the Missouri Terrace gravels, the tributary outwash, and the Big Muddy alluvium. The basis of these estimates is the maximum estimated annual groundwater flow through the Big Muddy alluvium near Plentywood (DNRC 1990). The incremental approach to development and monitoring of groundwater conditions proposed by the conservation district would guide the development of these aquifers under this alternative.

Lower Missouri subbasin–Lower Missouri River drainage (continued)

APPLICANT PROJECT	SOURCE	TYPE OF RESERVATION	AMOUNT (af)	ALTERNATIVES CONSUMPTIVE USE	INSTREAM	COMBINATION	NO ACTION
CBI-9	Missouri River	Irrigation	646	▨			
CBI-10	Missouri River	Irrigation	2,096	▨		▨ ★	
CBI-11	Missouri River	Irrigation	4,084	▨		▨ ★	
CBI-12	Missouri River	Irrigation	3,939	▨			
CBI-13	Missouri River	Irrigation	33,157	▨			
CBI-14	Missouri River	Irrigation	609	▨	░ ★	▨	
CBI-15	Missouri River	Irrigation	1,504	▨		▨	
CBI-16	Missouri River	Irrigation	2,380	▨		▨	
CBI-17	Missouri River	Irrigation	1,351	▨	░ ★	▨ ★	
CBI-18	Missouri River	Irrigation	3,442	▨			
CBI-19	Missouri River	Irrigation	1,217	▨	░ ★	▨	
CBI-20	Missouri River	Irrigation	548	▨			
CBI-21	Missouri River	Irrigation	1,058	▨		▨	
DFWP	Missouri River reach #7	Instream	3,263,500[a]	░	▨	░	
DFWP	Missouri River reach #8	Instream	3,748,500[a]	░	▨	░	
DFWP	Redwater River reach #1	Instream	12,792	░	▨	░	
DFWP	Redwater River reach #2	Instream	14,200[a]	░	▨	░	

Little Lower Missouri subbasin–Poplar River drainage (continued)

APPLICANT PROJECT	SOURCE	TYPE OF RESERVATION	AMOUNT (af)	ALTERNATIVES CONSUMPTIVE USE	INSTREAM	COMBINATION	NO ACTION
Scobey	Poplar River/well	Municipal	168	■	■	■	
DA-21	S.F. Whitetail Creek	Irrigation	38	▨	░	▨	
DA-31	Groundwater	Irrigation	208	▨			
DA-32	Groundwater	Irrigation	92	▨			
DA-51	Poplar River	Irrigation	68	▨		▨	
DA-71	Groundwater	Irrigation	502	▨		▨	
DA-131	UT M.F. Poplar River	Irrigation	122	▨			
DA-151	Groundwater	Irrigation	316	▨		▨	
DA-152	UT Poplar River	Irrigation	9	▨	░	▨	
DA-153	UT Poplar River	Irrigation	119	▨			
DA-161	Police Creek	Irrigation	32	▨			
DA-181	UT M.F. Poplar River	Irrigation	120	▨			
DA-182	UT M.F. Poplar River	Irrigation	45	▨	░	▨	
DA-211	E.F. Poplar River	Irrigation	82	▨			
DA-221	Spring, Olsen Coulee	Irrigation	320	▨		▨	
DA-251	Springs, Coal Creek	Irrigation	96	▨		▨	
DA-252	Springs, Coal Creek	Irrigation	156	▨		▨	
DA-261	Poplar River	Irrigation	158	▨			
DA-281	Groundwater	Irrigation	236	▨			
DA-291	UT E.F. Poplar River	Irrigation	228	▨			
DA-341	Poplar River	Irrigation	84	▨		▨	
DA-371	UT Butte Creek	Irrigation	3	▨	░	▨	
DFWP	E.F. Poplar River	Instream	6,870	░	▨	░	
DFWP	M.F. Poplar River	Instream	10,685	░	▨	░	
DFWP	Poplar River	Instream	21,207	░	▨	░	
DFWP	W.F. Poplar River	Instream	13,121	░	▨	░	

■	First priority of use
▨	Second priority of use
░	Third priority of use
☐	Not included in this alternative

a Instream flow requests that have been reduced to ½ the average annual flow

Little Missouri subbasin–Little Missouri River drainage

APPLICANT/ PROJECT	SOURCE	TYPE OF RESERVATION	AMOUNT (af)	ALTERNATIVES: CONSUMPTIVE USE	INSTREAM	COMBINATION	NO ACTION
CT-011	Little Missouri River	Irrigation	425	▨	░	▨	
CT-012	North Butte Creek	Irrigation	260	▨			
CT-131	Little Missouri River	Irrigation	240	▨	░	▨	
CT-141	UT Long Draw	Irrigation	120	▨		▨	
CT-161	Elkhorn Creek	Irrigation	42	▨		▨	
CT-162	UT Elkhorn Creek	Irrigation	50	▨		▨	
CT-181	Cottonwood Creek	Irrigation	225	▨		▨	
CT-191	Little Missouri River	Irrigation	247	▨			
CT-241	Little Missouri River	Irrigation	269	▨		▨	
CT-243	UT Beaver Dam Creek	Irrigation	9	▨		▨	
CT-244	NF Beaver Dam Creek	Irrigation	105	▨		▨	
DFWP	Little Missouri River	Instream	32,562	░	▨	░	

Little Missouri subbasin–Boxelder Creek drainage

APPLICANT/ PROJECT	SOURCE	TYPE OF RESERVATION	AMOUNT (af)	ALTERNATIVES: CONSUMPTIVE USE	INSTREAM	COMBINATION	NO ACTION
CT-121	Boxelder Creek	Irrigation	255	▨			
CT-122	Lampkin Gulch	Irrigation	90	▨			
CT-151	Sherril Creek	Irrigation	54	▨		▨	
CT-152	UT Boxelder Creek	Irrigation	17	▨		▨	
CT-153	Hawksnest Creek	Irrigation	84	▨		▨	
CT-154	UT Boxelder Creek	Irrigation	14	▨		▨	
CT-171	Freshwater Draw	Irrigation	165	▨		▨	
CT-221	Boxelder Creek	Irrigation	311	▨		▨	
CT-251	Boxelder Creek	Irrigation	290	▨	░	▨	
CT-261	UT East Lo Creek	Irrigation	20	▨		▨	
CT-262	UT Lo Creek	Irrigation	3	▨		▨	
CT-310	UT Boxelder Creek	Irrigation	45	▨		▨	
CT-320	Boxelder Creek	Irrigation	39	▨			
CT-330	Boxelder Creek	Irrigation	130	▨	░	▨	
CT-370	Boxelder Creek	Irrigation	107	▨			
CT-380	Boxelder Creek	Irrigation	36	▨			
DFWP	Box Elder Creek	~~Irrigation~~ Instream	20,682	░	▨	░	

■ First priority of use

▨ Second priority of use

░ Third priority of use

☐ Not included in this alternative

a Instream flow requests that have been reduced to 1/2 the average annual flow

COORDINATED GROUNDWATER DEVELOPMENT ALTERNATIVE

> The Sheridan County Conservation District would be granted a reservation for the maximum amount of water DNRC believes the Westby-Dagmar and associated aquifers ~~can provide without harmto existing water right holders and wetlands~~ might sustain. The water could be used on a first-come-first-served basis for any of the proposed projects. To help ensure that existing water right holders and wetlands would not be adversely affected, the Board would ~~condition the reservation to have no force unless~~ limit full use of the reservation until the area is declared a closed basin or controlled groundwater area ~~pursuant to 85-2-506 MCA~~. Under this alternative, Plentywood's application also would be granted with first priority.

364. **Comment:** Page 119, paragraphs 6 and 7 - The Service (USFWS) agrees with this language and perhaps it could be expanded upon.

Response: In the draft EIS, page 99, column 2, paragraph 2, criteria are set forth that the Reservation Oversight Committee would have to follow in approving requests to use reserved water. Data collection and monitoring needs can be specified by the Reservation Oversight Committee. There may be cases in which there is not a need for additional data. Concerning the required approval by the Reservation Oversight Committee for developing the groundwater, the following sentence has been added to the description of alternatives in Chapter Five of the draft EIS.

> Once the area is designated a closed basin or controlled groundwater area, additional water development would for the most part be limited to the amount of water reserved to the conservation district, although some exceptions could be made for domestic and stock water use. ~~Groundwater supervisors~~ An Oversight Committee ~~appointed by DNRC~~ could oversee administration of the ~~controlled groundwater area~~ reservation. ~~These commissioners~~ This Committee could include ~~one representative each from the conservation district, U.S. Fish and Wildlife Service, Sheridan County Planning Department, Ducks Unlimited, or other conservation group, a DNRC hydrogeologist, and an existing a Sheridan County water user.~~ a hydrogeologist, a Sheridan County irrigator, and representatives of the conservation district, USFWS, the Sheridan County Planning Department, and an environmental group.
>
> Requests to use reserved water would have to be approved by the Committee. The ~~supervisors~~ Committee would only approve a request to use reserved water if ~~they~~ it finds that: (1) there would be no substantial adverse effect to existing water right holders; (2) there would be no substantial adverse effect to wetlands; and (3) the water is suitable for irrigation, and irrigating with it would not damage soil productivity. The ~~groundwater supervisors~~ Committee could specify monitoring or data collection needs or establish criteria on which to base permitting decisions. Test drilling and aquifer analysis would be required prior to development of irrigation wells to ensure that water is available in sufficient quantity and quality. Soils also would be analyzed to ensure that long-term soil productivity would not be damaged, given the quality of the water that would be used for irrigation. The amounts of water granted to the district under this alternative by aquifer would be as follows:.

Aquifer	Amount (af/yr)	Approximate area that could be irrigated (acres)[a]
Westby-Dagmar outwash including Coalridge channels and recharge channels	11,179	3,572
Missouri River terrace gravels (preglacial Missouri River)	2,000	639
Tributary outwash deposits	2,000	639
Big Muddy alluvium	2,300	735
Total	17,479	5,585

[a] Assumes an annual water requirement of 3.13 af per acre irrigated

Designation of a closed basin or controlled groundwater area in Sheridan County could be effective in regulating allocations and withdrawals of groundwater. Although the Board could ~~condition~~ limit full use of the Sheridan County Conservation District's reservation on the designation of a basin closure or controlled groundwater area, there is no certainty that it would be so designated. Creation of a controlled groundwater area requires at least 20, or one-fourth, of the groundwater users in an area to petition the Board for such a designation, or DNRC must propose the designation to the Board. The Board must then give public notice and hold a hearing. The findings of the hearing would determine if a controlled groundwater area is needed.

The basin can be closed by the legislature or by DNRC. Closures by DNRC require a petition of at least 10, or one-fourth, of the water users in the source of supply followed by an administrative rulemaking procedure.

If a controlled groundwater area is not declared, or a basin is not closed, the Board could reduce the amount to that specified under the Partial Granting Alternative, or deny the reservation request.

365. **Comment:** Page 101, first column, last paragraph - What is the source of the statement that about 75 percent of the water the Board reserved for applicants in the upper Missouri River basin is not subject to the basin closure? What quantity of water is the 75 percent based upon? The statement needs further explanation. Also, the first sentence states that the closures are not permanent. Three of the closures (Teton, Madison, Jefferson) are permanent closures. Only the basin closure above Morony Dam is temporary.

Response: The comment only refers to water reserved for consumptive use. About 257,094 af of water was reserved for consumptive use by the Board in the Missouri basin above Fort Peck Dam. Of this amount, 206,332 af, or about 80 percent, is for a portion of the basin that is not closed--the Missouri River basin below Morony Dam excluding the Teton River drainage.

The statement in the EIS implying that the closures in the Teton, Madison, and Jefferson rivers are temporary is incorrect. These closures are permanent. Only the closure for the basin above Morony Dam is temporary. About 18,836 af, or 7 percent, of the water reserved for consumptive use by the Board in the upper Missouri basin is in basins that are permanently closed. The following changes have been made.

About 75 percent of the water the Board reserved for applicants in the upper Missouri River basin reservation proceeding is not subject to the basin closures discussed in Chapter Two ~~and the closures are not permanent~~. Calculations of the effects of lower Missouri River basin reservations begin with the assumption that all water the Board reserved for applicants in the basin above Fort Peck Dam would be fully used. Upper Missouri River basin reservations would alter streamflows in the Milk River and the Missouri River below Fort Peck Dam. These streamflow alterations could affect fisheries, wildlife, and recreational resources along these streams.

366. **Comment:** One additional aspect of the "Coordinated Groundwater Development Alternative" that we (Montana Audubon Society) are unclear about is this: why is Ducks Unlimited specifically mentioned as a possible member of the area's Coordinated Groundwater Development Commission? The prairie pothole area in Sheridan County is a critical area for numerous wetland dependent species, with ducks representing only a small number of species using this area. We would specifically request that interested conservation groups be consulted--and try to agree upon--the conservation representative on the commission. We, specifically, would like to be consulted in this matter.

Response: DNRC agrees with your suggestion of representation of conservation interests on the Reservation Oversight Committee for the Sheridan County Groundwater Area (if a basin closure or controlled groundwater area is established). Our mention of Ducks Unlimited in the draft EIS as a possible member of that committee was meant only as an illustration. The paragraph has been changed in response to comment 364.

367. **Comment.** On page 101, the comment that "much" of the water diverted for irrigation evaporates or is consumed by plants is erroneous. Consumptive use by irrigated agriculture in terms of the percentage of the amount diverted is not as significant as this statement infers. The statement should be changed to accurately reflect the fact that much of the water which is diverted by agriculture provides recharge to ground water aquifers or returns to the source as return flow.

Response: The following change is made to the draft EIS.

WATER QUANTITY AND DISTRIBUTION

The use of additional water for irrigation and municipal reservations would alter streamflows and groundwater levels. Instream flow reservations would not directly affect the existing water quantity or distribution, but could have indirect effects. The following paragraphs identify general ways in which the quantity and distribution of water in streams and reservoirs would be affected by the proposed reservations under the alternatives.

~~Much of the water diverted for irrigation evaporates or is consumed by plants.~~ Water that is diverted for irrigation may be consumed by plants, lost to evaporation, or may return to the stream. Excess water applied to crops returns to a stream as surface runoff or seeps into the ground and moves downward to the water table. In instances where a stream and water table are connected, this water may, over time, return to the stream. Water that leaks from canals also may return to a stream. Excess water that is diverted for irrigation and eventually discharges to a stream, either via surface water or groundwater, is referred to as irrigation return flow. The percentage of diverted water that returns to the stream as surface or groundwater return flows varies with the situation. Older, less efficient irrigation systems may return in excess of 70 percent of the diverted water, while modern sprinkler systems will generally limit return flows to a small amount.

368. **Comment:** Page 112, second paragraph - The conclusionary statement that impacts will be "much less" under the Instream Alternative should be stricken. In fact, the Instream Alternative may result in adverse impacts to annual average flows in Box Elder Creek area compared with the proposed water-spreading projects. The conclusionary statement should be eliminated.

Response: Inclusion of the water-spreading projects in the Instream Alternative would increase irrigation diversions and decrease average annual flows. The proposed water-spreading diversions also would conflict with the requested channel maintenance flows, causing additional adverse impacts. The following changes have been made.

> **Boxelder Creek Drainage:** Average annual flows in Boxelder Creek would be depleted 1.5 percent under the Consumptive Use Alternative (Figure 6-10). Depletions would be concentrated in the summer with the most severe effects during August. During dry years, the present average August flows of 2.9 cfs would be dried up. During typical years, flow reductions of 22 percent would lower August flows from 11.8 cfs to 9.2 cfs. Water-spreading projects would tend to redistribute some of the peak springtime flows to later months, thereby offsetting some of the summertime impacts from full service irrigation. Impacts would be slightly less under the Combination Alternative and ~~much less~~ practically nonexistent under the Instream Alternative.

369. **Comment:** Page 117 discusses Donovan's definition of the sustainable yield of the aquifer and states his definition is "vague and oversimplifies the concept of sustained yield." Several alternative definitions are discussed; yet the reader is left in the dark as to which definition should be used or which is used in the draft EIS. This becomes important when discussing the proposed alternatives; the draft EIS should address the definition of sustained yield used in making these determinations.

Response: The paragraph shown is added.

> **Estimates of Available Groundwater:** Estimates of the amount of groundwater that could be extracted from the Westby-Dagmar aquifer on sustainable basis range from 6,330 af/yr (Donovan 1988) to 16,000 af/yr (Gallagher 1991). Average annual withdrawals of groundwater are estimated to be about 4,821 af/yr in 1988 (Donovan 1988). This reduces the estimated remaining available groundwater in the Westby-Dagmar outwash, Coalridge channels, and recharge channels to a level between 1,500 and 11,100 af/yr. Little information is available upon which to base estimates of groundwater availability from tributary outwash deposits, Missouri River terrace gravels (preglacial Missouri River), and the Big Muddy Creek channels. DNRC estimates that a total of some 6,300 af/yr may be available from these aquifers. Table 6-1 summarizes the estimates of groundwater availability.
>
> For the purposes of this document, the term "sustainable yield" is used and means the same as "safe yield" described by Fetter (1980) or Freeze and Cherry's (1979) "optimal yield." These are flexible terms that can be redefined if necessary.

370. **Comment:** In the past in order to get a water permit, it would include an objection from the Medicine Lake Wildlife Refuge at Medicine Lake, Montana, which implied that by pumping underground water we were depleting the levels of the refuge. I (Steve Brekke) have not seen any evidence that this is occurring as all of the static water levels in the irrigation wells are above the static water levels of the lake at Medicine Lake Refuge.

I spoke with Mr. Waren about that fact which to me did not seem to make good sense. If indeed the level of the lake was correlated to the static water levels in the area irrigation wells and it did seem to draw down in the summer, although this may be an act of nature in that the lake is going down because of evaporation. I do remember that was discussed at the meeting. Also, if the lake was connected to the aquifer and it was drawn down in the summer, why doesn't the lake rise after the irrigators are through pumping which usually occurs about the first part of September or earlier? At that time, the evaporation is at a minimum until the time the lakes are frozen over and evaporation is virtually nothing. I have not seen any documentation that indicates that this is happening and the only way that the lake rises is due to surface water diversion into the refuge system.

Mr. Waren briefly mentioned this at the meeting and said that it would be another factor to consider as Mr. Joe Donovan's study indicated that there was a correlation with the aquifer and the level of various lakes. I firmly believe that the only correlation to the aquifer and adjacent lakes would have to be based on the corresponding static level of the aquifer and the static level of the lakes and if there was a change in the level of one the other would have to have an identical change at the same time

The object of this letter is to allow you to see my point of view and hopefully it will help you and your staff in completing the EIS and to help dispel some of the past myths and future problems that certainly will rise in the future.

371. **Comment:** Page 34 - Please provide more information for the conclusion in the EIS that Medicine Lake is hydrologically connected to the Westby-Dagmar channel.

Response to 370 and 371: Your observations of fall and winter lake levels that raise questions about the interpretation that Medicine Lake is a discharge area for the Westby-Dagmar aquifer are now noted in the final EIS. The following changes have been made to pages 34 and 120 of the draft EIS. On page 34:

> The principal lakes in the Westby-Dagmar channel were categorized by Donovan (1988) as open, closed, or restricted outflow types. Generally, closed or restricted outflow type lakes tend to have poor water quality because the concentration of minerals in the lake increases as water is removed by plants and evaporation.
>
> Donovan (1988, p. 65) concluded that a strong hydraulic connection exists between Medicine Lake and the underlying Westby-Dagmar aquifer. This connection was based on both the responses of water levels in wells completed near Medicine Lake (well 84-36A) and near Homestead Lake (well 84-39A) to lake levels, and on geologic cross-sections in the vicinity of Medicine lake. However, observations by Brekke (1994) concerning the behavior of lake levels in the fall and winter, and by Smith (1994) concerning water level changes in shallow and deep terrace gravel portions of the aquifer east of Medicine Lake while pumping from the terrace gravel, raise questions about the nature of the connection between the lake and the aquifer. As noted below, the complex nature of the aquifer makes generalizations difficult, and the interaction between water levels at any particular depth and location in the aquifer and nearby lakes would require detailed studies.
>
> The preglacial or ancestral Missouri River in northeastern Montana flowed northeastward from a point near Poplar through a wide valley that is now buried by glacial debris. This buried valley extends from near Poplar northeast beneath Medicine Lake and the Dagmar channel (see Map 4-1). River gravel deposited by the preglacial Missouri River is still in place as subsurface layers of terrace gravel 20 to 90 feet thick. This

> gravel is a productive aquifer in some areas and is known variously as the Wiota Gravel and the ancestral Missouri terrace gravel.
>
> The glacial aquifers in Sheridan County form a complex aquifer system. The various aquifers are known to connect or not connect to one another in some locations, while it is unclear how they may be related in other locations. In a context of aquifer management, it is useful to use the term "aquifer system" to refer to all of the major outwash and terrace gravel aquifers in southeastern Sheridan County, shown in Map 4-1.
>
> ### WATER USE
>
> MBMG calculated the volume of water pumped from the Westby-Dagmar channel for irrigation in 1984 to be 5,275 af. The annual average volume from 1983 to 1988 was estimated at 4,821 af (Donovan 1988). In 1988, the calculated usage was 6,025 af, the highest volume used up to that date. The total annual volume permitted by DNRC for high-yield irrigation wells in both the Westby-Dagmar channel and the ancestral Missouri terrace gravel east of Big Muddy Creek as of February 1993 was 8,126 af/yr. This area has 26 irrigation systems ranging from 123 to 250 acres. Wells that supply water for these irrigation systems are largely situated on the Westby-Dagmar channel although one or two are in the ancestral Missouri terrace gravel. Generally, permitted volumes are greater than the volumes actually used.
>
> USFWS holds water rights for 19,570 af/yr of groundwater "tributary" to Medicine Lake. Since this lake ~~is~~ may be connected to the Westby-Dagmar channel, groundwater in the aquifer is important to USFWS operations.

The following changes have been made to page 120 of the draft EIS.

> Donovan (1988) states that as much as 100,000 af of the approximately 114,000 af of water stored in lakes in the Medicine Lake drainage might be connected to the Westby-Dagmar aquifer. These connected lakes, which may include Medicine Lake, are susceptible to decline as a result of groundwater withdrawals for irrigation. The importance of maintaining shallow groundwater in order to sustain connected surface water bodies is the most obvious constraint to groundwater irrigation development in the Westby-Dagmar channel.

The fact that static water levels in irrigation wells are above the static water levels in lakes is not necessarily evidence that no hydraulic connection exists between the wells and the lakes. This is because the aquifer material provides a resistance to flow. The water levels in an aquifer generally slope in the direction of groundwater movement, as opposed to lying flat as in an open body of water. Higher water level elevations in wells compared to lakes suggests that if there is a connection, groundwater would move from the well locations to the lake rather than from the lake toward the wells. Large differences in water level elevations in a well close to a lake would suggest that the two are not directly connected through coarse, permeable materials.

372. **Comment:** Page 123, column 2, paragraph 1 - The first sentence is not quite accurate. Instream flow reservations are subject to review by the Board and permits for consumptive reservations can be granted on a temporary basis until the reserved water is put to use. The discussion on page 181, Water Availability, is a better statement of the issue.

Response: The following change is made.

> If the Board grants reservations, the reserved water will not be available for new appropriation by permit because it will be committed either for consumptive use or instream flows, unless the reservations are changed or modified by the Board. Amounts of water that would still be available for appropriation if ~~all~~ instream reservations are granted to the maximum amount allowed by law are summarized in Appendix J. Granting reservations for consumptive use also would reduce the amount of water available for new appropriation (see Water Quantity and Distribution section). However, DNRC, with approval of the Board, may issue a temporary permit to use water reserved for consumptive use until the reservant needs the water.

Also see revisions to Appendix J in Changes to the Draft EIS.

373. **Comment:** Page 129, paragraph 8 - This paragraph contains the statement that "45 percent less irrigated acreage" would amount to "45 percent less water" being used. Please provide the accuracy of this statement, and its basis.

Response: The draft EIS is changed as follows.

> The Combination Alternative would provide for less irrigation than the Consumptive Use Alternative and would have less effect on water quality. This alternative would have 45 percent less irrigated acreage, with ~~about 45 percent less water used~~ a decrease in average streamflow of about 15 percent at the North Dakota border. Many of the parcels included under the Consumptive Use Alternative but eliminated under the Combination Alternative contain problem soils (poor drainage, erosive soils, saline soils), which, if irrigated, could contribute to the salt and sediment load of the Missouri River.

374. **Comment:** Page 132, last paragraph - A specific number in front of "miles of large diameter pipeline" is needed.

Response: The following changes are made.

> Although not specifically stated in the applications, it is assumed that irrigation pipelines would be buried at least 3 feet deep to clear tillage equipment and protect them from vandalism. Soil disturbances would be greatest for pipelines with a diameter greater than 17 inches. Table 6-6 shows ~~miles~~ feet of large diameter pipeline that would be needed for proposed irrigation projects along the Missouri River.

375. **Comment:** On page 143, Sheridan County Groundwater Area, paragraph 2 - A better explanation of why irrigation would not be possible on Fish and Wildlife Service easement wetlands is necessary. The Service, under various program authorities, purchases the right of the landowner to drain, level, fill, or burn the wetland. Any human degradation of the wetland resulting in water loss is unlawful

Response: Wetland easement areas are shown in draft EIS Map 4-6 (see revised Wetlands Map in the final EIS). The change below has been added to p. 143, column 2, of the draft EIS.

> ### SHERIDAN COUNTY GROUNDWATER AREA
>
> Wetlands inventoried by USFWS in 1983 are located within many of the sprinkler irrigation projects being considered in the Sheridan County Groundwater Area (Appendix F). Developing these projects could disturb wetlands to the point that a 404 Permit would be required from the Corps of Engineers, and farm program benefits could be lost due to the "Swampbuster" provisions of the 1990 Food, Agriculture, Conservation, and Trade Act. Consequently, farmers may choose not to develop a project that could disturb a wetland in order to protect their federal farm program benefits. SCS is responsible for the final determination of wetlands with regard to the Swampbuster provisions.
>
> Irrigation development would not be possible on some land covered by wetland easements or owned by USFWS (Appendix F).
>
> The U.S. Fish and Wildlife Service has purchased permanent wetland easements on a substantial number of lands proposed for potential irrigation development in the Sheridan County Groundwater Area (see revised Wetlands Map in the final EIS). Because these wetland easement agreements are for perpetuity, any wetland draining, leveling, filling, or burning is prohibited and would be unlawful. The Fish and Wildlife Service also holds "grassland" easements within some of the wetland easement areas that would prohibit irrigation development and other cultivation within the grassland easement area.

376. **Comment:** Referring to page 144, paragraph 1 of the draft EIS - Violation and prosecution under the Endangered Species Act could occur only if the development of projects that adversely affected piping plover habitat resulted in "take" of piping plovers that was not authorized by a permit issued under authority of sec. 10(a)(2)(A) of the Endangered Species Act of 1973, as amended.

Response: The last sentence has been changed as follows.

> The Sheridan County Groundwater Area has numerous lakes, ponds, and marshes, of which as many as 85 percent are directly connected to the water table. Consequently, any lowering of the water table, due to either the pumping of a nearby well or the combined effects of pumping many wells, could affect the levels of these surface water bodies (see Groundwater section for further discussion). Reduced water levels would decrease the surface areas of these lakes, ponds, and marshes and also that of the moist fringe areas surrounding them. Plant species adapted to drier conditions would then invade previously moist areas. Neither the Swampbuster provisions nor 404 Permit process would protect wetlands from the effects of lowered water levels. However, provisions of the Endangered Species Act, if enforced, could result in prosecution of persons responsible for ~~development of projects that adversely effect habitat of the piping plover~~ developing projects that adversely affect piping plover habitat, resulting in 'take' of piping plovers not authorized by permit issued under authority of sec 10(a)(2)(A) of the Endangered Species Act of 1973, as amended. "Take" means to harass, harm, pursue, hunt, shoot, wound, trap, capture, or collect, or to attempt to engage in any such conduct.

377. **Comment:** Page 149, paragraph 3 The reference Leathe & Nelson (1986) should be (1989).

Response: The EIS is changed as follows.

Other methods are available to estimate instream flow needs. Several are discussed in DNRC 1992; Lamb 1989; Leathe and Nelson ~~1986~~1989; and EA Engineering, Science, and Technology, Inc. 1986.

378. **Comment:** Page 151, Table 6-19 - Need to correct table alignment on line 4.

Response: Table 6-19 has been changed on the following page.

379. **Comment:** Page 152, column 1, last paragraph, and column 2, first paragraph - The last paragraph in column 1 describes the changes in flow that would occur on the East Fork of the Poplar River under both the Consumptive Use and Combination Alternatives. Then, the first paragraph in Column 2 says there will be no change on the East Fork under the Combination Alternative. Which analysis is correct?

Response: Corrections to page 152, column 1, paragraph 5, are indicated below.

> On the Poplar River near the Fort Peck Indian Reservation, aquatic habitat would be affected to a lesser degree under the Combination Alternative than under the Consumptive Use Alternative (Table 6-20). Flows of about 11 cfs would provide a small amount of water flowing through riffles and pools to maintain aquatic habitat. Under the Combination Alternative, flows would fall to ~~3.9~~ 4.3 cfs in July of dry years and cease in August of dry years.
>
> On the East Fork of the Poplar River, flows would be reduced by about ~~0.4~~ 0.7 cfs in July and 0.2 cfs in August of dry years under the Consumptive Use ~~and Combination~~ Alternatives. ~~Flows would cease during August in dry and very dry years and further stress aquatic habitat.~~

380. **Comment:** Footnote c is not in references. Also, for the Poplar River, flows under the Instream Alternative for August read 6.0 and (3.0). They should probably read 0.6 and (0.3).

Response: The following reference has been added for footnote b rather than c: USGS undated. Water Availability Data for streams in the Lower and Little Missouri River Basins. Provisional Data Compiled by the U.S. Geological Survey, Helena, Montana.

Under the Instream Alternative, flows would not change as a result of new irrigation projects in the Poplar River if flows would fall below the instream reservations. Consequently a portion of Table 6-20 has been changed to reflect this.

Table 6-20. Changes in flow affecting aquatic habitat in portions of the Poplar River Drainage.

Stream	Minimum flow to protect aquatic habital (cfs)[a]	Existing flow (cfs)[b] during dry and very dry years (very dry in ())[b]		Flow (cfs) under the Consumptive Use Alt. in dry and very dry years		Flow (cfs) under the Instream Alt. in dry and very dry years		Flow (cfs) under the Combination Alt. in dry and very dry years	
		July	August	July	August	July	August	July	August
Poplar River at	11	6.0	1.0	2.6	0	~~5.9~~ 6.0	~~6.0~~ 1.0	4.3	0.2
reservation boundary		(3.0)	(1.0)	(0)	(0)	~~(2.9)~~ (3.0)	~~(3.0)~~ (1.0)	(1.3)	(0.2)

Table 6-19. **Changes in flow affecting aquatic habitat in the Missouri River near the Montana-North Dakota border under the Consumptive Use, Instream, and Combination alternatives**

Approximate flows(cfs) necessary to maintain aquatic habitat in the Missouri River at the Montana-North Dakota border during certain periods[a]			Percent of the time flow is equaled or exceeded under existing conditions ~~Alternative~~[b]		Percent of the time flow is equaled or exceeded under Consumptive Use Alternative[b]		Percent of the time flow is equaled or exceeded under Instream Alternative[b]		Percent of the time flow is equaled or exceeded under Combination Alternative[b]	
Purpose	Period	Flow (cfs)	Period	Percent	Period	Percent	Period	Percent	Period	Percent
Maintain habitat for sauger spawning and incubation	May 11 - June 30	11,500	May	21	May	18	May	19	May	19
			June	27	June	25	June	26	June	25
Maintain main channel riffle habitat	July 1 - May 10	7,000	July	92	July	84	July	91	July	85
		~~August~~	~~72~~	~~August~~	~~70~~	~~August~~	~~71~~	~~August~~	~~71~~	
			August	72	August	70	August	71	August	71
			September	69	September	66	September	66	September	66
			October	39	October	36	October	36	October	36
			November	45	November	42	November	42	November	42
			December	100	December	100	December	100	December	100
			January	100	January	100	January	100	January	100
			February	100	February	100	February	100	February	100
			March	98	March	95	March	95	March	95
			April	69	April	68	April	70	April	70
			May	65	May	61	May	64	May	64

[a] SOURCE DFWP 1991

[b] Includes flow reductions resulting from exercise of reservations granted in the upper Missouri River water reservation process

381. **Comment:** Referring to page 154 of the draft EIS - The sentence beginning "Projects diverting... " and the following sentence are both questionable. What evidence/documentation was used to make these statements?

Response: In 2 years in 10 during August, there would be 0.1 cfs or less flowing water, while in September there would be no flowing water in Little Beaver Creek according to DNRC's modeling (see page D-9 of the draft EIS). Under these conditions, a pump diverting water from a standing pool would reduce water levels in the pool. Project CT 071 would divert water at a rate up to 1.3 cfs. Project CT 301 was listed in error and the paragraph has been corrected to read:

> **Little Beaver Creek Drainage:** Flow reductions in this drainage under the Consumptive Use Alternative probably would not be great enough to reduce the spring channel catfish spawning run substantially in most years. From May to July, median flows of 15 to 53 cfs would be reduced by about 3 cfs or less. However, during the summer in very dry years, flows would be at or very near zero, and habitat would be further stressed. Flows would cease about 2 years in 10 during September and be only 0.1 cfs during August. Project~~s~~ CT-71, diverting flow directly out of the stream channel, ~~(CT-71 and CT-301)~~ would decrease water levels of standing pools in dry years. There would be no increases in flow or benefit to aquatic habitat from return flows during the fall and winter.

Information to substantiate the last sentence referred to can be found in Appendix D of the draft EIS. By comparing the fall and winter flows for Little Beaver under existing conditions (p. D-7) and under the Consumptive Use Alternative (p. D-9), one can see that there are no significant increases in flow after the irrigation season.

382. **Comment:** Page 191, column 2, first full paragraph - The third sentence states that DFWP proceeded under the belief that riffles are the most productive areas of a stream." This is not a belief; it is an accepted fact that is well documented in the literature.

Response: The offending sentence has been changed in the EIS.

> DFWP based its request on the Wetted Perimeter Inflection Point (WETP) method in cold water streams in the Milk River drainage and riffles in the Missouri River. This method determines the amount of water needed to cover riffle areas in specific stream reaches. DFWP proceeded ~~under the belief~~ with the knowledge that riffles are the most productive areas of a stream, where propagation and growth of fish-food organisms occur. If enough flow remains in a stream to keep riffle areas wet, then most of the food-producing areas of a stream will be maintained. Generally, the amount of water requested on streams where the WETP method was used is the amount required to cover riffles. Reserving this amount of flow also would protect other types of stream habitat, such as pools and bank cover.

383. **Comment:** Page 191, column 2, first full paragraph - "The Fixed Percentage Method was used on one stream reach. Desirable flow amounts are assumed to equal a fixed percentage of the estimated flow." Replace the estimated flow with the stream's average annual flow.

Response: Page 76 of DFWP's application states, "An average annual flow of 0.6 cfs was estimated by the USGS for Reach #1 of Beaver Creek." Consequently, the paragraph in question has been changed in the EIS.

> The Fixed Percentage Method was used on one stream reach. Desirable flow amounts are assumed to equal a fixed percentage of the ~~esti-~~

> ~~mated flow~~ stream's estimated average annual flow. While this method can be used as a general indicator of flows necessary to protect aquatic habitat, the assessment it provides is less sensitive to conditions in individual stream reaches than the WETP method.

384. **Comment:** The draft EIS briefly touches on the concept that DFWP can only request half of the average annual flow. For example, page 191 states, "Table 3-2 identifies the amount of water DFWP requested. On some gauged streams (Table 5-1), DFWP requested more than the maximum allowed under Section 85-5-331, MCA, which is half the average annual flow." First, I (Gerald Goroski) do not believe it is Section 85-5-331, MCA, that should be referenced. I believe it's Section 85-2-316(6), MCA. More importantly, I would recommend that the final EIS explain in detail why the channel maintenance flow amounts don't have to meet the same legal requirement as do the rest of DFWP's monthly instream flow requests.

Response: With respect to the section of the Montana Codes Annotated that limits instream flow requests to half the average annual flow on gauged streams, you are correct. See following paragraph for the appropriate change.

> DFWP used several different methods to determine the amount of streamflow necessary to protect fish, wildlife, recreation, and water quality, as described in Appendix C. Table 3-2 identifies the amount of water DFWP requested. On some gauged streams (Table 5-1), DFWP requested more than the maximum allowed under ~~Section 85-5-331, MCA,~~ Section 85-2-316, MCA, which is half the average annual flow.

With regard to the legal requirements for channel maintenance flows, however, you are incorrect. As a type of instream flow, channel maintenance flows also are subject to the 50 percent limit. That is to say, channel maintenance flow requests, like all instream flow requests, are limited to half the average annual flow of record on gauged streams (§ 85-2-316(6), MCA).

385. **Comment:** Page B-9 - The second Sheep Creek shown under the upper Missouri River and tributaries should be listed under the Smith River drainage at the bottom of the page.

Response: The table is changed as shown on following page.

386. **Comment:** Page C-3, column 1, second paragraph - This method is based on the assumptions that "aquatic organisms contributing the majority of food for gamefish are produced in riffle - areas, and that food supply for the fish is a major factor in determining the number of weight of fish a stream can support during the warmer months when fish grow and new fish are recruited into the population."

The word "of" should probably be "or." Again, the importance of riffles as food producers is well documented in the literature. While it may be designated as one of the method's assumptions, it is a valid and well documented assumption.

Response: The word "of" has been changed to "or." Your comment regarding the validity of assumptions behind the WETP method is noted.

> ### WETTED PERIMETER INFLECTION POINT METHOD
>
> In determining the amount of instream flow necessary to protect habitat in riffle areas of most streams, DFWP used the Wetted Perimeter Inflection Point (WETP) method of calculation (DFWP 1989a). This method is based on the assumptions that aquatic organisms contributing the majority of food for gamefish are produced in riffle areas, and that food supply for the fish is a major factor in determining the number ~~of~~ or

DFWP (cont.)

UPPER MISSOURI RIVER AND TRIBUTARIES (continued)

Missouri River #3	Holter Dam to Great Falls	Jan 1 - Dec 31	3,327
Prickly Pear Creek #1	Rabbit Gulch to Hwy 12 bridge in East Helena	Jan 1 - Dec 31	22
Prickly Pear Creek #2	Hwy 12 bridge in East Helena to Lake Helena	Jan 1 - Dec 31	30
Sevenmile Creek	Greenhorn Creek and Skelly Gulch to mouth	Jan 1 - Dec 31	1.0
Sheep Creek	Headwaters to mouth	Jan 1 - Dec 31	35
~~Sheep Creek~~	~~Headwaters of South Fork to mouth~~	~~Jan 1 - Dec 31~~	~~22~~
Silver Creek	Helena Valley Irrigation Canal to mouth	May 1 - Nov 30	13.0
		Dec 1 - Apr 30	5.4
Sixteenmile Creek	Billy Creek to mouth	Jan 1 - Dec 31	20
Spokane Creek	Helena Valley Irr. Canal to mouth	May 1 - Nov 30	4.0
		Dec 1 - Apr 30	3.0
Stickney Creek	North and South forks to mouth	Apr 1 - Apr 30	7
		May 1 - May 31	34
		June 1 - June 30	35
		July 1 - Jul 31	7
Tenmile Creek	Headwaters to mouth	Jan 1 - Dec 31	12.0
Trout Creek	Springs near Vigilante Campground to mouth	Jan 1 - Dec 31	15.0
Virginia Creek	Headwaters to mouth	Jan 1 - Dec 31	6.0
Wegner Creek	Headwaters to mouth	Apr 1 - Apr 30	8
		May 1 - May 31	41
		June 1 -June 30	38
		July 1 -July 31	8
Willow Creek	Headwaters to mouth	Jan 1 - Dec 31	3.5
Wolf Creek	Headwaters to mouth	Jan 1 - Dec 31	7.0

DEARBORN RIVER DRAINAGE

STREAM	REACH DESCRIPTION	DATES GRANTED	AMOUNT ALLOWED (cfs)
Dearborn River	Headwaters to mouth	Jan 1 - Dec 31	110
Flat Creek	Headwaters to mouth	Jan 1 - Dec 31	7.5
MF Dearborn River	Headwaters to mouth	Jan 1 - Dec 31	9.5
SF Dearborn River	Headwaters to mouth	Jan 1 - Dec 31	11.5

SMITH RIVER DRAINAGE

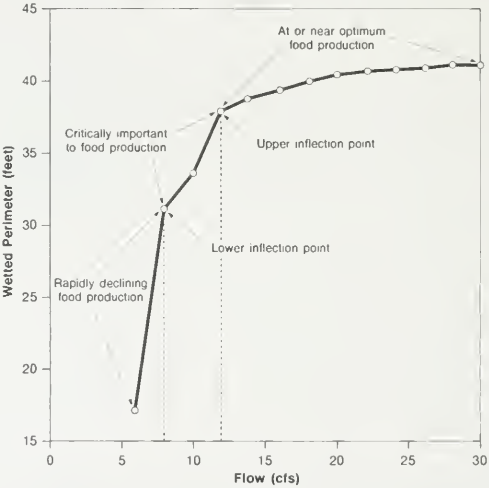
STREAM	REACH DESCRIPTION	DATES GRANTED	AMOUNT ALLOWED (cfs)
Big Birch Creek	Headwaters to mouth	Jan 1 - Dec 31	11
Eagle Creek	Headwaters to mouth	Jan 1 - Dec 31	2.5
Hound Creek	EF Hound Creek and Middle Creek to mouth	Jan 1 - Dec 31	35
Nowlan Creek	Headwaters to mouth	Jan 1 - Dec 31	3.8
NF Deep Creek	Headwaters to rock cascades	Jan 1 - Dec 31	1.0
NF Smith River	Headwaters to mouth	Jan 1 - Dec 31	9
Rock Creek	Headwaters to mouth	Jan 1 - Dec 31	11
Sheep Creek	Headwaters of South Fork to mouth	Jan 1 - Dec 31	22
Smith River #1	North and South Forks Sheep Creek	Jan 1 - Dec 31	78.5
Smith River #2	Sheep Creek to Hound Creek	Jan 1 - Dec 31	150
Smith River #3	Hound Creek to mouth	Jan 1 - Dec 31	80
SF Smith River	Headwaters to mouth	Jan 1 - Dec 31	7
Tenderfoot Creek	Headwaters to mouth	Jan 1 - Dec 31	15

> weight of fish a stream can support during the warmer months when fish grow and new fish are recruited into the population. Riffles also are used by many gamefish for spawning and rearing of their young. Wetted perimeter is the linear distance along the bottom and sides of a stream that is in contact with water when the stream is viewed in cross section (see Figure C-1). As flows change, the wetted perimeter changes. If water is maintained in riffles, a substantial amount of stream width will extend near enough to streamside vegetation to provide shade and protection to pools and runs where adult fish reside.

387. **Comment:** Page C-3, column 1, second paragraph - Figure B-2 should be C-2.

Response: Figure B-2 has been changed to C-2.

Figure ~~B-2~~ C-2. An example of a relationship between wetted perimeter and flow



Source: DFWP 1989

388. **Comment:** Page C-4, column 1, first full paragraph - DFWP did not request any flows other than the high inflection point flows in this application. The first sentence implies that DFWP did.

Response: The EIS is changed as follows.

> According to DFWP, "The Wetted Perimeter Inflection Point Method provides a range of flows (between and including the lower and upper inflection points) from which a single instream flow recommendation is selected. Flows below the lower inflection point are judged undesirable based on their probable impacts on food production, bank cover, and spawning and rearing habitats, while flows at and above the upper inflection point are considered to provide near optimal conditions for fish. The upper and lower inflection points are believed to bracket those flows needed to maintain high and low levels of aquatic habitat potential" (DFWP 1991). In the lower Missouri River basin water reservation process, DFWP only requested high inflection point flows where the WETP method was used.

389. **Comment:** There is no discussion on the assumptions used to calculate return flows from different types of projects. Such a discussion was provided in the Upper Missouri Basin Draft EIS, page 38. Such a discussion probably would apply also to the way the values shown in Appendix L were calculated.

390. **Comment:** I (Larry Olson) would like to have the consumptive use definition as it is used in the draft EIS clarified. When a volume of water is applied as flood irrigation, is the total volume considered to be a 100 percent consumptive use? Depending upon several factors, some of which are infiltration rate, water holding capacity, soil moisture content, vegetation, rate of application, field slope, and climatic conditions, percentages of this given volume contribute to enhancing wetlands, recharging groundwater reserves, and also at times create return flow to water source. For these reasons, consumptive use of a given volume of water can vary greatly and consumptive use should not be considered 100 percent usage. In the consumptive use analysis for Table 7-1, page 194, what percentage was used?

Response to 389 and 390: The following additions have been made to Appendix D that describe models in greater detail. Table 7-1 was developed using the definition of "consumptive use" provided in the Glossary of the draft EIS (page xi).

WATER AVAILABILITY MODELS

Water availability models were developed for the Missouri, Milk, and Little Missouri River subbasins to estimate the effects of proposed reservations on streamflows under each alternative. Each model is based on streamflow and irrigation data from the period between 1928 and 1986.

The Missouri River water availability model described by Dolan and DeLuca (1993) was extended downstream to the North Dakota state line and used to model streamflows in the lower Missouri River and its tributaries (Figure D-1). The Missouri River model uses extended streamflow data (USGS 1992), irrigated acreage data from the past (BUREC undated), and climate data to adjust streamflow values so that data from different years can be compared on an equitable basis despite variations in the amount of irrigated land from year to year. Although any year could have been chosen, all flows were corrected to a 1986 level of irrigation development because it is the last year for which data are available and because irrigation was then near its peak in most subbasins. The model computes streamflows at various locations (nodes) after adjusting for losses (such as water used for irrigation projects), gains (such as tributary inflow between nodes, groundwater return flows), and storage in reservoirs. The Missouri River model is linked to the Milk River basin model at Virgelle (in scenarios that include the Virgelle Diversion) and at the confluence of the Milk River

The Missouri River model computes depletions due to new irrigation projects by applying an estimate of crop irrigation requirements, project efficiency, irrecoverable losses, and return flows. Monthly crop irrigation requirements were computed for each node by the U.S. Bureau of Reclamation using weather station data and the Jensen-Haise method (Jensen and Haise 1965). The ratio of the water consumed by crops divided by the amount diverted is called the project efficiency. Project efficiencies were estimated for each project using the Farm Irrigation Rating System (FIRS) program developed by the U.S. Soil Conservation Service for Wyoming and modified for Montana (Taylor 1988). The efficiencies of the projects in each node basin were combined using an acreage-weighted average to yield a nodal efficiency. Irrecoverable losses were assumed to equal 15 percent of the diverted water that was not

> consumed by crops. The irrecoverable losses primarily account for evaporation and noncrop consumption. The remaining portion of diverted water was divided between surface and groundwater return flows based on irrigation category. Sprinklers were assumed to contribute only 10 percent of the available return flows to surface return flows, while other irrigation categories contributed 50 percent. Surface return flows were assumed to return to the stream during the month of diversion, while groundwater return flows were assumed to return over a 2-year period. The groundwater return flow lag factor was computed for each basin using estimates of basin permeability, storativity, and drainage (Glover 1974).
>
> Municipal depletions were estimated using efficiencies that were obtained for each municipality. Available return flows were separated between surface and groundwater return flows based on the characteristics of the water supply system.

391. **Comment:** Page D-3, column 2, second full paragraph - In describing the contents of Tables D-1 and D-2, a little more explanation would be helpful. Only two sentences describe these tables. The reader has difficulty in understanding just what these tables mean to each other.

Response: Please note changes.

INTERPRETATION OF MODEL RESULTS

> ~~The model results are presented in the tables that include monthly and annual flow statistics. The "mean" is the average of all of the modeled streamflow values for each month. In the case of the difference tables (e.g. Table D-2), the "mean" is the average of the differences between computed flows for the existing conditions and those for alternative or scenario.~~ The model results are presented in Table D-1. Table D-1 summarizes monthly and annual flow statistics. Percentile and average flows are presented for each month and for the annual data as well. Table D-1 gives an indication of expected flow values in "wet" (10 percent), and "dry" (80 percent) years.

Table D-2 summarizes the differences between each alternative and the existing conditions. Table D-2 was derived by subtracting individual flow numbers for the existing conditions from each of the other alternatives, and computing the percentile and average flow statistics on the resulting series of difference values. Table D-2 is useful for determining the variability in streamflow depletions that may be expected under each alternative. Table D-2 does not relate flow reductions to "wet" or "dry" years.

392. **Comment:** Page D-3, column 2, last paragraph - In the last sentence, there is a reference to 18 cfs in Table D-2. 18 cfs does not appear in Table D-2 for Battle Creek in April. The number appears to be 15 cfs. Also, you should describe how the negative numbers and zeros in the tables should be read.

Response: Please note changes. Last paragraph on page D-3 should read as follows.

> The percentile streamflow values ~~give an indication to~~ indicate the distribution of the monthly flows. For example, Table D-1 may be read as ~~"10 percent of the time, the average April streamflow in Battle Creek exceeds 629 cfs." In the case of the difference tables, one might say "10 percent of the time, the difference between average April streamflows in Battle Creek exceeds 18 15 cfs" (Table D-2).~~"Under existing conditions, 80 percent of the time, the average April streamflow in Battle Creek

> exceeds 20 cfs." In the case of the difference tables, one might say, "Under the Consumptive Use Alternative, 80 percent of the time, depletions to average April streamflows are less than 97 cfs." In Table D-2, "0" values indicate no change from existing conditions, while a negative value indicates a flow reduction relative to existing conditions.

393. **Comment:** In Appendix H, make the following corrections to Missouri River Reaches #7 and #8: Reach #7: Rainbow trout are common rather than rare. Yellow perch are uncommon rather than rare. Reach #8: Brown trout are rare rather than absent. Western silvery minnow are present.

Response: The suggested changes have been made in the EIS.

Table H-1. Fisheries value class and relative fish abundance in streams where DFWP has requested reservations in the Lower Missouri river basin

Key to Symbols

FAMILY	SCIENTIFIC NAME	COMMON NAME
Sturgeon	Scaphirhynchus albus	Pallid sturgeon
	Scaphirhynchus platorynchus	Shovelnose sturgeon
Paddlefish	Polyodon spathula	Paddlefish
Gar	Lepisosteus platostomus	Shortnose gar
Mooneye	Hiodon alosoides	Goldeye
Trout	Salmo gairdneri	Rainbow trout
	Salmo trutta	Brown trout
	Salvelinus fontinalis	Brook trout
	Salvelinus namaycush	Lake trout
Pike	Esox lucius	Northern pike
Minnow	Cyprinus carpio	Carp
		Western silvery minnow
	Notemigonus crysoleucas	Golden shiner
	Semotilus margarita	Pearl dace
	Semotilus atromaculatus	Creek chub
	Phoxinus eos	Northern redbelly dace
		Northern redbelly/finescale dace
	Hybopsis gracilis	Flathead chub
	Couesius plumbeus	Lake chub
	Notropis atherinoides	Emerald shiner
	Notropis stramineus	Sand shiner
	Hybognathus hankinsoni	Brassy minnow
		Western plains/silvery minnow
	Hybognathus placitus	Plains minnow
	Hybognathus nuchalis	Silvery minnow
	Pimephales Promelas	Fathead minnow
	Rhinichthys cataractae	Longnose dace
Sucker	Carpiodes carpio	River carpsucker
	Cycleptus elongatus	Blue sucker
	Ictiobus bubalus	Smallmouth buffalo
	Ictiobus cyprinellus	Bigmouth buffalo
	Moxostoma macrolepidotum	Shorthead redhorse
	Catostomus catostomus	Longnose sucker
	Catostomus commersoni	White sucker
	Catostomus platyrhynchus	Mountain sucker
Catfish	Ictalurus melas	Black bullhead
	Ictalurus natalis	Yellow bullhead
	Ictalurus punctatus	Channel catfish
	Noturus flavus	Stonecat
Codfish	Lota lota	Burbot
Killifish	Fundulus kansae	Plains killifish
Stickleback	Culaea inconstans	Brook stickleback
Sunfish	Lepomis cyanellus	Green sunfish
	Lepomis gibbosus	Pumpkinseed
	Lepomis macrochirus	Bluegill
	Micropterus dolomieui	Smallmouth bass
	Pomoxis annularis	White crappie
Perch	Perca flavescens	Yellow perch
	Stizostedion canadense	Sauger
	Stizostedion vitreum	Walleye
	Etheostoma exile	Iowa darter
Drum	Aplodinotus grunniens	Freshwater drum
Sculpin	Cottus bairdi	Mottled sculpin
smelt		Rainbow smelt

Source: MNHP 1993
changes are circled

394. **Comment:** Page L-18, Table L-6 - Table does not appear to be discussed anywhere in the text of the draft EIS.

Response: The third sentence of the first paragraph on page L-3 has been changed in the EIS.

> Tables L-1 and L-2 list the value of water for each of the proposed irrigation and municipal reservations. Consumptive use water values for the proposed irrigation projects are derived with methodology described in Goroski (1993) and the DNRC Methodology Manual (1991). These values are annualized differences between the net revenues (Tables L-5 ~~and~~ through L-7) from the existing ~~dryland~~ farming or ranching operations and net revenues from the proposed irrigated alfalfa-barley farming operations.

In particular, Tables L-5 and L-7 represent the net revenues from existing farming/ranching operations and from the proposed full service, irrigated operations in the lower Missouri, Milk, Little Missouri, and Sheridan County Groundwater Area subbasins. Column 1 of Tables L-5 and L-7 lists the proposed projects. Columns 2 through 5 list the estimated net revenues from the proposed irrigated operations given the availability of water 10 out of 10 years, 8 out of 10 years, 6 out of 10 years, and 4 out of 10 years, respectively. Column 6 of Tables L-5 and L-7 lists the estimated net revenues from the existing farming/ranching operations. These net revenues were estimated assuming the existing land uses found in Appendix G of the draft EIS. In the case that the existing land already used irrigation, DNRC assumed that water was available 10 out of 10 years.

Table L-6 represents the net revenues from existing and proposed irrigating operations in the Battle Creek and Milk River drainages given the proposed Battle Creek Reservoir (BL-181). Since BL-181 was a supplemental irrigation project, the estimated net revenues for BL-181 did not fit into the structure of Table L-5. For example, DNRC assumed that this supplemental storage project would provide water 10 out of 10 years for the 6,000 acres proposed in the project. On the other hand, the net revenues from existing irrigation would vary depending on water availability. Therefore, Column 1 represents the estimated net revenue given the proposed supplemental storage project while Columns 2 through 7 represent net revenues given existing irrigating operations under varying water availability conditions.

395. **Comment:** The source for the data in the tables (Economics Consultants Northwest) is not shown in the references.

Response: The following source should be added to the list of references in the draft EIS:

> Economic Consultants Northwest. 1993. Unpublished data developed from information published by the U.S. Bureau of Economic Analysis and the Montana Department of Revenue.

396. **Comment:** On page 127, column two the reference (DNRC 1992) should apply to the Final Upper Missouri River Basin EIS, not the draft EIS. See page R-7.

Response: The reference to the Upper Missouri River Basin Draft EIS is correct, but the citation should be (DNRC 1991) rather than (DNRC 1992). The following reference has been added:

> Montana Department of Natural Resources and Conservation. 1991. Missouri River basin draft environmental impact statement for water reservations above Fort Peck Dam. Helena: Montana Department of Natural Resources and Conservation.

DNRC STAFF CHANGES TO THE DRAFT EIS

The following section presents changes made to the draft EIS by DNRC staff during its review of comments. Deleted material is shown with lines through it. New material is shaded.

The following changes to the Summary in the draft EIS were made in the final EIS.

SUMMARY

MISSOURI RIVER WATER RESERVATION STATUTE

In 1985, the Montana Legislature directed the Montana Department of Natural Resources and Conservation (DNRC) to begin a water reservation proceeding for the Missouri River basin. In subsequent sessions, the legislature directed DNRC to add the Little Missouri River drainage to the proceeding. The legislature felt that implementation of a water reservation procedure would encourage more coordinated development of the water resources in the basin and would help form a strong and unified basis for protecting Montana's share of the Missouri River water from downstream states.

Under Montana water law, water can be reserved for existing or future consumptive uses of water and for maintaining instream flows to protect aquatic life, recreation, and water quality. Only public entities such as local governments, conservation districts, and state and federal agencies can apply for and hold water reservations. DNRC was assigned by statute to coordinate the process and to provide technical and financial assistance to conservation districts and municipalities in preparing their applications.

Due to the vast size of this basin, the Missouri River reservation proceeding has been split into two parts. Applications for water in the upper portion of the basin, which encompasses the drainage area upstream from Fort Peck Dam, were considered first. After an environmental review and contested case hearing, the Board of Natural Resources and Conservation (Board) made a final decision on the upper basin applications in June 1992. DNRC then began preparation of this draft environmental impact statement (EIS) for the lower basin reservation applications. The Board must reach a decision on water reservation applications in the Missouri River basin below Fort Peck Dam (including the Milk and Little Missouri River basins) by December 31, 1994.

APPLICATIONS

DNRC received 26 reservation applications for water in the lower basin. Fourteen municipalities applied for 46,167 acre feet a year to meet future growth. Eleven conservation districts requested 276,407 acre-feet a year, primarily for ~~471~~ 472 proposed irrigation projects covering 157,994 acres. The Montana Department of Fish, Wildlife and Parks (DFWP) applied to reserve instream flows on 21 streams or stream reaches to protect fish, wildlife, recreation, and water quality.

EIS PROCESS

The Montana Environmental Policy Act (MEPA) requires preparation of an EIS for major state government actions that have the potential to significantly affect the human and natural environment. This EIS examines the environmental, social, and economic impacts of the proposed requests. DNRC held public meetings in five towns throughout the basin to identify important issues for analyses and inclusion in the EIS. DNRC developed a computer model of the Missouri River basin to assess physical and legal availability of water. This draft EIS is based on the above information and research and analysis by DNRC staff and consultants. Following release of the draft EIS, there will be a 60 day period for interested parties to comment on the draft EIS. DNRC also will hold public meetings across the basin to receive comments on the draft EIS. The final EIS will address all substantive comments on the draft EIS.

ALTERNATIVES

To address the full range of options available to the Board and potential impacts, DNRC selected several hypothetical alternatives to analyze in the EIS. They are: the Consumptive Use, Instream, Combination, and No Action alternatives. In Sheridan County, where extensive groundwater development is proposed, three ~~different~~ additional alternatives were analyzed: the Grant All, Partial Granting, and Coordinated Groundwater Development alternatives.

Municipalities were included under all but the No Action Alternative and given first priority because of the relatively small amount of water requested for their purposes and the high value of water for municipal use.

The Consumptive Use Alternative emphasizes the use of water for irrigation and municipal purposes. First priority in this alternative goes to municipalities, followed by proposed irrigation projects, and then instream uses. All irrigation projects proposed in the reservation applications were included in this alternative.

The Instream Alternative gives first priority to municipal uses, but emphasizes instream reservations for the protection of fish, wildlife, recreation, and water quality. Some irrigation reservation requests were included in this alternative, but with third priority.

To some extent, the Combination Alternative is similar to the Consumptive Use Alternative in that it gives first preference to municipalities, second to proposed irrigation projects, and third to instream uses. It differs primarily in that proposed irrigation projects are only included if they are at least marginally economically and financially feasible at least 50 percent of the time.

In Sheridan County, the City of Plentywood would have first priority under all but the No Action Alternative. The Grant All Alternative would allow the Sheridan County Conservation District to use all the water it requested in compliance with the district's reservation management plan. The Westby-Dagmar aquifer has been studied and preliminary estimates of sustainable yield are available. Aquifers associated with Missouri River terrace gravels, tributary outwash deposits, and Big Muddy alluvium have not been studied extensively. Under the Partial Granting Alternative, the Board would grant the Sheridan County Conservation District a reservation for ~~the amount of water DNRC believes the Westby-Dagmar and associated aquifers can sustain~~ (7,809 af/yr), which includes both the amount the Westby-Dagmar aquifer can probably sustain without adverse effects to existing water right holders and wetlands and the amount the associated aquifers might sustain. The Coordinated Groundwater Development Alternative would allow a larger reservation of 17,470 af/yr--the maximum amount that DNRC believes the aquifers might sustain. ~~The alternative is conditioned on the creation of a controlled groundwater area.~~ To help ensure that existing water right holders and wetlands would not be adversely affected, the Board would limit full use of the reservation until the area is declared a controlled groundwater area or the basin is closed. If a controlled groundwater area is not designated or the basin is not closed, the Board could reduce the amount to that specified under the Partial Granting Alternative or deny the reservation altogether. In either case, a Committee would be appointed by the Board ~~Groundwater commissioners would be appointed by DNRC and would include area water users, the conservation district, USFWS, the Sheridan County Planning Department, an existing water user, Ducks Unlimited and a DNRC hydrogeologist. The commissioners would~~ to oversee implementation of the reservation.

Under the No Action Alternative, DNRC describes trends that might unfold through the year 2035 if no ~~water is reserved for any purpose~~ reservations are granted.

BOARD'S AUTHORITY

The Board can grant, modify, or deny any or all of the reservation requests. Applicants must establish to the satisfaction of the Board the following four criteria:

a. the purpose of the reservation;
b. the need for the reservation;
c. the amount of water necessary for the reservation; and
d. that the reservation is in the public interest.

Besides these criteria, the Board also must ensure that the reservation applicants make progress toward development of the proposed use with reasonable diligence and that no reservations are granted that would adversely affect senior water rights. The Board will have to base its decision on the decision criteria described in Chapter Seven of the draft EIS and rely on information in the applications, draft and final EIS, and on testimony presented at the contested case hearing.

IMPACTS UNDER ~~THE~~ CONSUMPTIVE USE, COMBINATION, INSTREAM, GRANT ALL, PARTIAL GRANTING, AND COORDINATED GROUNDWATER DEVELOPMENT ALTERNATIVES

GENERAL CONSIDERATIONS

Environmental impacts are generally greatest under the Consumptive Use Alternative, less under the Combination Alternative, and least under the Instream Alternative. ~~In the Sheridan County Groundwater Area~~ Because the Sheridan County Conservation District has not proposed to include consideration of adverse effects to wetlands in its management plan, the possibility of impacts ~~would be~~ was considered greatest under the Grant All Alternative and less under the Partial Granting and Coordinated Groundwater Development alternatives in the Sheridan County Groundwater Area. Some proposed projects included in all but the No Action Alternative would have substantial impacts. Not all potential impacts were assessed for some of the larger projects, where information was not required or available in the applications. A separate environmental review may be required before larger projects such as CBI-13 in Roosevelt County or the Battle Creek Reservoir (project BL-181) could be constructed.

WATER QUANTITY AND DISTRIBUTION

Impacts to streamflows would be greatest under the Consumptive Use Alternative, which would reduce flows slightly in the Milk and Missouri rivers, and moderately to substantially in the Poplar and Little Missouri River drainages. In several of these rivers and streams, late summer streamflows would be reduced to zero or near zero during dry years. Impacts to streamflows would be less under the Combination Alternative and least under the Instream Alternative.

GROUNDWATER

In the Sheridan County Groundwater Area, the amount of water applied for in the Grant All Alternative (113,587 af/yr) greatly exceeds any estimate of groundwater available for sustainable use. The impacts of this alternative would depend on how much water the Sheridan County Conservation District develops. The Westby-Dagmar aquifer might yield as much as 50,000 af/yr without affecting senior water rights for other wells. However, this would cause a drastic alteration in the hydrology of the aquifer. Aquifer water levels would decline and lakes and wetlands connected to the aquifer would decrease in size and ~~eventually~~ possibly be eliminated. As aquifer levels decline, senior users would incur higher pumping costs even though they could still full exercise their rights.

Under the Partial Granting Alternative, major changes in the hydrology of the aquifer would be less likely because of the limited amount of water granted. However, this alternative does not effectively "tie up" all available groundwater in the area, which might limit the ability of the Sheridan County Conservation District to manage groundwater withdrawals.

Under the Coordinated Groundwater Development Alternative, the maximum estimated sustainable yield of the aquifers would be granted and a basin closure or controlled groundwater area ~~would~~ may be established. The Sheridan County Conservation District would gain the right to the groundwater, while a local ~~board overseeing the controlled groundwater area~~ committee overseeing the reservation would have a hand in determining how and where the reserved water is used, and when the sustainable level of development is achieved. DNRC would cease accepting applications for new water use permits only if a controlled groundwater area or basin closure were established.

LEGAL WATER AVAILABILITY

While water may be physically available for a reservation at the point of diversion, it may already be appropriated by a water user downstream. Water in route to downstream users is not legally available for consumptive use by junior users. Existing water users such as irrigators and Indian tribes already claim much of the flow in many of the Missouri River tributaries. ~~During the contested case hearing, it will be determined if reservations will adversely affect the use of senior water rights.~~

By law, water reservations cannot adversely affect the amount of water legally available to holders of water rights with a priority date earlier than July 1, 1985, in the Milk and Missouri River drainages and July 1, 1989, in the Little Missouri River drainage. However, a reservation may provide the holder with a stronger basis to object in DNRC proceedings on applications by existing water right holders to change their ~~if an existing water right user wishes to change the~~ point of diversion, place of use, purpose of use, or place of storage. ~~, all senior and junior water right holders, including those with water reservations, have a right to object to the change if they feel that the exercise of their water rights would be adversely affected. This same legal right allows holders of water reservations to object to water right claims submitted in the statewide adjudication proceeding. Holders of water reservations, like all other water right holders, may seek relief from the district court to protect their water rights.~~ Obtaining a water reservation may also strengthen the reservant's standing to object to water rights claims submitted in the statewide adjudication proceeding, although the issue remains to be determined by the Water Court.

WATER QUALITY

Water reservations for consumptive use would cause a decline in water quality in some streams and groundwater systems. Higher concentrations of nutrients, pesticides, sediments, and salts would be noticeable in some waters, but in most instances the increases would be minor. Short-term increases in sediments would result from construction of reservoirs and diversion structures.

Arsenic originating in geothermal areas of Yellowstone Park persists in reduced concentrations in the lower Missouri River. Sufficient information is not available to determine whether new irrigation development with water containing arsenic would cause local and downstream surface water to increase in arsenic concentration and violate the state's ambient water quality standard.

In the Milk River subbasin, the cumulative effect of Battle Creek projects on water quality in the Milk River would be small. Streamflow of the Milk River near Harlem would be reduced by about 1 percent in median flow years if the Montana projects were developed.

The Poplar River contributes about 1.3 percent of the average annual streamflow and chemical load of the Missouri River near Culbertson (less in dry years). Because of this, the effects of consumptive use of Poplar River water on the Missouri River are small. Groundwater development in Sheridan County would similarly have a small effect on water quality in the Missouri River.

Within the Little Missouri subbasin, consumptive flow depletion in dry years would increase total dissolved solids and sodium adsorption ratios, and irrigation development would require careful application of water and special management to minimize decline in soil productivity and crop yields. Reduction in summer streamflow would increase the frequency of no flow and could raise water temperatures, lower dissolved oxygen, and thereby harm aquatic life.

SOILS

In general, reservations that would result in the conversion of riparian areas or rangeland to irrigated cropland would affect soils through the loss of organic matter, reduced water-holding capacity, and increased susceptibility to erosion. These effects would be somewhat offset once an alfalfa crop is established. Where reservations convert dry cropland to irrigation, soil structure will improve, wind and water erosion will decrease, and nitrogen and organic fertility will increase. Projects that might have substantial adverse soil impacts are identified in Chapter Six. Other effects of consumptive use projects on soils are generally minor.

STREAM CHANNEL FORM

Impacts to stream channels generally would be minor. In some instances, consumptive water uses could decrease channel capacity by increasing the deposition of sediment. Instream reservations would not change existing stream channel forms. By trapping sediment and altering flow patterns, the proposed Battle Creek dam project (BL-181) could substantially alter stream channel characteristics in Battle Creek downstream.

VEGETATION

Impacts to vegetation would result from replacement of natural plant communities with agricultural crops, inundation of riparian and upland plant communities by reservoirs, reduced streamflows, lowered water tables, and increased proliferation of noxious weeds. Substantial losses to riparian vegetation would occur along the lower Missouri River under the ~~Combination~~ Consumptive Use Alternative, where up to 8,956 acres would be lost, and ~~Consumptive Use~~ Combination Alternative, where up to 8,404 acres would be lost. Wetlands near the Missouri River also would be lost under the Consumptive Use and Combination alternatives. The potential for loss of wetlands in the Sheridan County Groundwater Area due to lower water tables is a substantial concern under all alternatives but greatest under the Grant All Alternative.

LAND USE

Proposed irrigation reservations would convert nonirrigated cropland, pasture, and rangeland to irrigated fields. Reservations would allow newly irrigated cropland to increase in the basin by about 22 percent (57,387 acres) under the Consumptive Use Alternative, 12 percent (32,106 acres) under the Combination Alternative, and 3 percent (7,363 acres) under the Instream Alternative. In the Sheridan County Groundwater Area, irrigated land could increase by 540 percent (42,600 acres) under the Grant All Alternative, 32 percent (2,400 acres) under the Partial Granting Alternative, and 70 percent (5,500 acres) under the Coordinated Groundwater Development Alternative. Thirty-seven irrigation projects may have other substantial land use impacts, including pipelines, canals, and transmission lines. These are identified in Chapter Six. Other land use impacts are generally minor.

FISH AND AQUATIC HABITAT

Low flow conditions already stress gamefish populations and aquatic habitat on some rivers and streams in the basin. Further consumptive uses would generally worsen conditions on these rivers and streams. Streams most severely affected by the proposed consumptive use reservations under the Consumptive Use Alternative include the Poplar River and East Fork Poplar River, Little Missouri River, Boxelder Creek, and Little Beaver Creek. Under the Grant All Alternative in the Sheridan County Groundwater Area, aquatic habitat could be reduced in Big Muddy Creek.

Streams where the effects could be less include the Missouri River and smaller ephemeral tributary streams. Stored water might be released from Fort Peck Reservoir to offset most water depletions in the lower Missouri River. Reservations for instream flows would help maintain the existing aquatic habitat and fisheries. It is unlikely that the proposed irrigation storage projects could support a fishery. On large irrigation projects, fish could be killed in the diversion structures, though this could be minimized through proper design.

Construction and operation of Fort Peck Dam have greatly modified habitat of pallid sturgeon, a federally listed endangered species that inhabits the Missouri River. The effects of proposed flow reductions would reduce habitat of the pallid sturgeon slightly. These reductions would be in addition to existing impacts caused by the dam.

WILDLIFE

Wildlife habitat would be reduced by conversion of native vegetation to cropland as described under the vegetation section. Draining of wetlands and lakes would reduce the amount of habitat available to waterfowl and shorebirds. Least terns, a federally listed endangered species, are found along the lower Missouri River, and piping plovers, a listed threatened species, are found along the lower Missouri River and beside saline lakes and ponds in the Sheridan County Groundwater Area. Reductions of flow or lowering of water tables could make these species and other waterfowl more vulnerable to predation, although such effects have not been quantified.

Farming operations could disturb nesting raptors, and cultivation could destroy grouse courtship and breeding areas. However, in most cases, site- specific information is not available to determine the extent of the effect, if any.

Adverse effects to wildlife habitat would be greatest under the Consumptive Use Alternative where 4,100 acres of native woodland (mostly riparian cottonwood habitat) and scrub/shrub habitats and 4,800 acres of native prairie and mixed prairie habitats would be cultivated along the lower Missouri River. Impacts would be lower under the Combination Alternative and slight under the Instream Alternative. In the Sheridan County Groundwater Area, water tables could be lowered the most and have the greatest effect under the Grant All Alternative and least under the Coordinated Groundwater Development Alternative.

In the Sheridan County Groundwater Area, habitat of the piping plover, a federally listed threatened species, could be affected by a lowering of water tables in wetlands used by these birds. Along the lower Missouri River, some projects are near areas known to be used by least terns or piping plovers and their nesting could be disturbed during project construction.

HISTORICAL, ARCHAEOLOGICAL, AND PALEONTOLOGICAL SITES

Proposed consumptive use reservations could affect up to 31 known historical or archaeological sites, although a small number of these are likely to contain information important to interpreting the past. No known paleontological sites would be affected. There is a moderate potential for discovery of historical, archaeological, and paleontological sites, particularly where projects would be developed on undisturbed rangeland. Most sites are located on private land where formal evaluation is not required to determine if the sites might be eligible for listing on the National Register of Historic Places, unless the Board would choose to do so as part of its approval of reservations. One exception would be burial locations which are known or are discovered upon development of a reservation project. Montana law requires that such sites be protected from disturbance.

STORAGE

Reservations may reduce water available for future storage projects. Existing water rights could be a greater constraint to the development of new storage than water reservations. The reservation applications include five water storage projects. Together, they could store up to 20,239 af/yr of water.

RECREATION

Instream reservations would help maintain streamflows on streams and rivers that are important to recreation. The small flow reductions that would occur in the Missouri River below Fort Peck Dam under any of the alternatives would have minor effects on recreation opportunities.

Flow increases resulting from the Virgelle project in the Milk River above Dodson during summer under all three alternatives might improve fishing and floating opportunities. If the Virgelle Diversion project is not constructed, fishing and floating opportunities in the Milk River would decrease slightly.

Under the Consumptive Use Alternative, dam operations on the Battle Creek project could improve stream fishing opportunities if habitat is improved and fish populations increase. While improved recreation is possible, seasonal reservoir drawdowns may limit the extent of the beneficial effects. New fishing or boating opportunities on the reservoir for Battle Creek Dam would be marginal due to repeated reservoir drawdowns for irrigation.

For the Poplar River, East Fork of the Poplar River, and prairie streams that support fish in the Little Missouri River drainage, already marginal fishing opportunities would decrease further under the Consumptive Use and Combination alternatives.

Possible effects at Medicine Lake National Wildlife Refuge from proposed pumping in the Sheridan County Groundwater Area include decreasing and changing locations available for wildlife observation and photography. Decreased water levels could further limit fishing opportunities in Big Muddy Creek and Medicine Lake.

Instream flow values for the middle Missouri and Marias/Teton subbasins (Duffield 1990) were used as approximate recreation values of an acre-foot of flow on rivers and streams in the lower Missouri ~~River basin study area~~ and Milk River subbasins. These values were $5.81 per acre-foot for July and August flows and $1.63 per acre-foot for flows during the rest of the year. The annual value of recreation losses (the recreational value per acre-foot of flow multiplied by estimated changes in average streamflow for each alternative due to proposed reservations) is estimated to be ~~$337,201~~ $326,430 under the Consumptive Use Alternative, ~~$191,454~~ $183,863 under the Combination Alternative, and ~~$16,968~~ $14,526 under the Instream Alternative. The annual value of recreation losses could not be estimated in Sheridan County or in the Little Missouri River subbasin.

HYDROPOWER

Consumptive use reservations eventually would increase the cost of electricity to ratepayers. They would do this by: (1) decreasing streamflows that are used to generate electricity; and (2) requiring production of additional electricity. These two actions would require production of replacement power that would be considerably more expensive than power from existing supplies. The total monetary impact to ratepayers would range from $2.18 million to $5.60 million a year under the Consumptive Use Alternative, $1.20 million to $3.00 million a year under the Combination Alternative, and $0.13 million to $0.38 million a year under the Instream Alternative. Impacts to ratepayers because of reduced hydroelectric generation could not be estimated for projects in Sheridan County. The impacts to ratepayers because of increased electric power use from proposed projects in Sheridan County would range from $0.19 million to $1.14 million a year under the Grant All Alternative; $0.01 million to $0.05 million a year under the Partial Granting Alternative; and $0.02 million to $0.13 million a year under the Coordinated Groundwater Development Alternative.

AGRICULTURE

Development of irrigation projects in the basin under any alternative would have small beneficial effects on jobs, personal income, taxes, and agricultural sales. About 12 jobs would be created among the four subbasins under the Instream Alternative and about 100 under the Consumptive Use Alternative. Benefits would be greatest in the Sheridan County Groundwater Area where, if all projects could be developed, 56 jobs might be created. Personal income in the basin would increase between $0.02 million a year under the Instream Alternative to $1.6 million a year under the Consumptive Use Alternative. County tax receipts would increase between $58,000 a year under the Instream Alternative and $151,000 a year under the Consumptive Use Alternative. Agricultural sales would increase between 0.5 percent under the Instream Alternative and 4.2 percent under the Consumptive Use Alternative.

SOCIAL EFFECTS

The reservations would not noticeably change the social character of communities in the Missouri River basin.

NO ACTION ALTERNATIVE

If the Board were to deny all reservation applications, consumptive water users could still apply through the water use permitting process to appropriate water for beneficial uses. A potential user also might be able to purchase water from tribes of the Fort Peck Indian Reservation or from existing water right holders. Municipalities could condemn existing water rights to meet needs when they occur in the future.

Some new irrigation projects would be built in the basin. However, the total acreage of irrigated land might remain stable as lower quality irrigated land goes out of production because of low crop prices and higher yields on good land.

If instream reservations are not granted, instream flows in many streams and rivers would not be protected by a water right. In some instances, increased consumptive uses could lead to streams becoming very low or going dry, resulting in adverse impacts to water quality, aquatic life, recreation, and wildlife. Tribal water rights and federal and state water quality standards for arsenic could provide some level of instream flow protection in some streams and rivers.

If present trends hold, few large storage projects will be built over the next 25 years. Emphasis during this period probably will be on rehabilitation and enlargement of existing facilities as defined in the state water plan.

OTHER REASONABLY FORESEEABLE ACTIONS

The U.S. Army Corps of Engineers is currently reviewing its master manual, which governs releases of water from Fort Peck and the system of downstream reservoirs it operates. The outcome of this review is not known, but could change flow patterns in the lower Missouri River. A draft EIS on this review is expected to be released in 1994.

USFWS has issued a recovery plan for endangered pallid sturgeon inhabiting the lower Missouri River. This plan calls for a more natural flow pattern in the river. It is not known what effect this will have on releases from Fort Peck Reservoir.

Canada is entitled to a substantial portion of the Milk River and half the flow of Milk River tributaries originating in Canada. If Canadians use the water they are entitled to and all requested reservations are granted, flows in the Milk River could be substantially reduced, and flows in the lower Missouri River would be reduced slightly. Shortages of water for irrigation along the Milk River would increase, and some irrigated land might go out of production. Impacts to water quality, aquatic habitat, and water based recreation also would increase.

If the Virgelle Diversion—for which BUREC's reservation application was approved during the upper basin reservation proceeding—is not constructed and Canadian and Indian water entitlements are fully developed in the future, a significant reduction in flow of the Milk River would occur. Under these conditions, chemical concen trations (salinity) of the Milk River would increase to the point that water is unsuited for irrigation use. Physical water quality may further decline with increases in temperature and turbidity and a reduction in dissolved oxygen. Concentrations of cadmium, iron, lead, and manganese in the Milk River at Nashua would approach or exceed the public drinking water standard more frequently.

Under the Fort Peck Compact between the tribes of the Fort Peck Indian Reservation and the State of Montana, the tribes may use up to ~~50,000~~ 475,000 af/yr of water from the Missouri River. The majority of this water would be used during the summer, but it is uncertain how the water would be used or where it would be diverted. (Please see page 41 of the draft EIS for a more detailed discussion of the Fort Peck Compact.) The cumulative effects on the lower Missouri River from the proposed reservations and the Fort Peck Compact might be reductions in flow, water quality, aquatic habitat, and recreational opportunities. Any such impacts would be in addition to those caused by state water reservations. These changes cannot be reasonably quantified at this time.

Reductions in streamflow due to the combined use by the Canadians, tribes of the Fort Peck Indian Reservation, and state water reservations could cause total dissolved solids and trace-element concentrations in the Missouri River to frequently exceed water quality standards and criteria for public drinking water, and might limit the suitability of the water for irrigation. Flow reductions probably would be accompanied by thermal increases and reduced dissolved oxygen concentrations harmful to aquatic life.

BOARD DECISION CRITERIA

The decision of whether to grant, modify, or deny the reservation applications rests with the Board, which must abide by several criteria that are discussed below. The ability of the requested reservations to meet these criteria is examined in DNRC's research and analyses of the reservation applications, as explained in Chapter Seven. ~~These results are preliminary and do not represent conclusions on w~~Whether any reservation request fully satisfies ~~any of these~~ criteria will be determined by the Board based on the hearing record. ~~Such determinations are made by the Board.~~

QUALIFICATION AND PURPOSE

The Board must determine (a) that of those who applied for reservations, all are qualified to reserve water through the Missouri River basin water reservation proceeding; and (b) the stated purposes for all reservations requested are beneficial uses under Montana law.

NEED

The regulation states that a water reservation is needed if "there is a reasonable likelihood that future instate or out-of-state competing water users would consume, degrade, or otherwise affect the water available for the purpose of the reservations," or if "there are constraints that would restrict the applicant from perfecting a water permit for the intended purpose of the reservation." All applicants identified a purported need to reserve water. Conservation districts want to secure water for agricultural production before the water is appropriated by other users in Montana or by downstream states. They also want to have the option to develop this water when the economic climate improves. Municipalities want to appropriate water to meet future growth when available water supplies are diminishing in the basin. DFWP wants secure instream flows to protect fish, wildlife, recreation, and water quality.

AMOUNT

The Board must determine the amount needed to fulfill the purpose of the reservations. This amount must be based on accurate and suitable measuring methods and determinations that no reasonable cost-effective measures could be taken within the reservation term to increase efficiency and lessen the amount of water required.

Conservation districts' requests are based on recorded crop requirements and efficiency of proposed irrigation systems. Many of the projects were designed for efficient sprinkler irrigation.

Municipalities requested enough water to service population growth to the year 2035. Increased population multiplied by per capita rate of consumption was used to calculate the total amount requested in the applications. Per capita rates were based on actual use requirements for each community. Population projections based on the 1990 census indicate that population growth and the associated amounts of water requested by 14 of the municipalities may be higher than expected to occur.

DFWP used several methods to determine its instream flow reservation requests. These methods are summarized in Appendix C.

PUBLIC INTEREST

Reservations for municipal water supplies and irrigation would provide monetary benefits to basin communities. However, they would decrease streamflows which could adversely affect recreation and hydropower production. Reservations for consumptive uses also would use additional power, which would eventually require the production of higher cost electricity. The value of an acre-foot of water for instream flow is based on recreation and electricity production. Table S-1 identifies the total benefits and costs of water uses under the three alternatives. Excluding the Sheridan County Groundwater Area, net benefits per year are greatest under the Instream Alternative (~~$37.60~~ $37.85 million), less under the Combination Alternative (~~$31.13~~ $31.29 million), and considerably lower under the Consumptive Use Alternative (~~$12.48~~ $12.71 million). Benefits and costs to recreation and hydropower production could not be estimated in the Sheridan County Groundwater Area.

Municipal water developments have benefits that exceed costs by $37.79 million because of the small amount of water consumed and the high value of this use under all three alternatives (Table S-2). This assumes that the proposed water use is actually needed by the municipalities. In contrast, proposed irrigation projects would consume large amounts of water. Total costs associated with the depletions would exceed total benefits by ~~$25.31~~ $25.08 million a year under the Consumptive Use Alternative and ~~$6.67~~ $6.51 million a year under the Combination Alternative. However, total benefits exceed total costs by ~~$0.01~~ $0.06 million a year under the Instream Alternative (Table S-2).

The value of an acre-foot of water for instream and consumptive uses can be compared when there is only enough water for one type of use. Outside of the Sheridan County projects, 54 proposed irrigation projects would value an acre-foot of water at a greater level than the instream values, and 109 proposed irrigation projects would value water less than the instream values. This assumes a 5 cents/kWh cost for replacement power and a 10-year-in-10 water availability. The value of an acre-foot of water for all municipal reservations exceeds the value of water for instream flow and proposed irrigation projects.

On each stream or stream reach, the number of requests that will give the greatest net benefit is based, in part, on the amount of water available. However, water availability may not be definitely known before the Board acts on the reservation requests.

Table S-1. Benefits and costs of water use under six alternatives ($ million)[a]

	Consumptive Use	Combination	Instream	GAA	PGA	CGDA
Irrigation	25.69	20.82	1.60	23.88	2.07	3.85
Municipal	~~39.96~~ 39.36	~~39.96~~ 39.36	~~39.96~~ 39.36	3.67	3.67	3.67
Recreation	~~-7.04~~ -6.81	~~-4.00~~ -3.84	~~-0.35~~ -0.30	unk	unk	unk
Hydropower production	-39.05	-21.94	-2.21	unk	unk	unk
Replacement power	-6.48	-3.12	-0.60	-3.96	-0.18	-0.47
Total	~~12.48~~ 12.71	~~31.13~~ 31.29	~~37.80~~ 37.85	23.59	5.56	7.06

GAA = Grant All Alternative, PGA - Partial Granting Alternative,
CGDA = Coordinated Groundwater Development Alternative (only for Sheridan County)

[a] Positive numbers represent net benefits, and negative numbers represent net costs.
All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate.

Table S-2. Benefits and costs of reservations for irrigation and municipal uses ($ million)[a]

	Consumptive Use	Combination	Instream	GAA	PGA	CGDA
Irrigation						
benefits	25.69	20.82	1.60	23.88	2.07	3.85
costs	~~-51.00~~ -50.77	~~-27.49~~ -27.33	~~-1.59~~ -1.54	unk	unk	unk
net	~~-25.31~~ -25.08	~~-6.67~~ -1.51	~~0.01~~ -0.06	unk	unk	unk
Municipal						
benefits	39.36	~~39.96~~ 39.36	39.36	3.67	3.67	3.67
costs	-1.57	-1.57	-1.57	unk	unk	unk
net	37.79	37.79	37.79	unk	unk	unk

GAA = Grant All Alternative, PGA = Partial Granting Alternative,
CGDA = Coordinated Groundwater Development Alternative (only for Sheridan County)

[a] Positive numbers represent net benefits, and negative numbers represent net costs.
All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate.

On page 2 of the draft EIS, the following changes have been made:

WHO HAS APPLIED

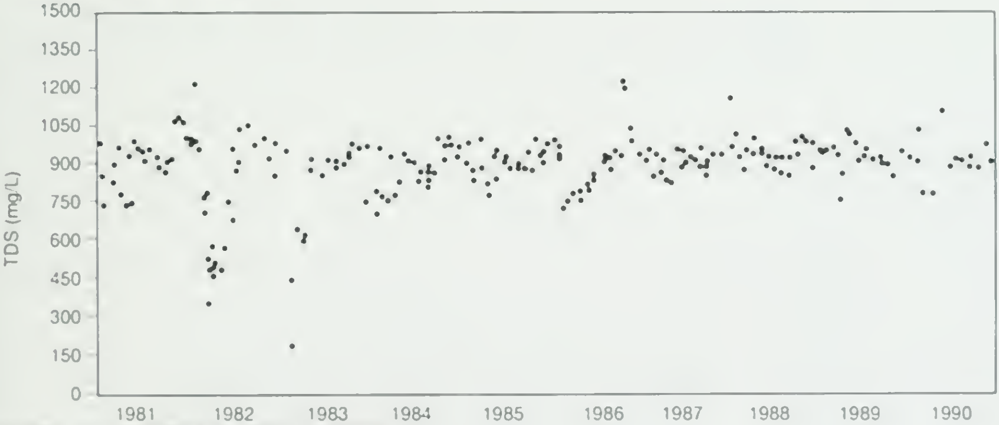
DNRC received applications from 11 conservation districts to provide water for ~~471~~ 472 irrigation, stockwater, and reservoir projects; from 14 municipalities; and from the Montana Department of Fish, Wildlife and Parks (DFWP) for instream flows on 21 stream segments. A more detailed list and discussion of the applicants' requests are presented in Chapter Three.

The following change has been made to page 20 of the draft EIS:

Stream gauge data were used to calculate available water for some projects, while flows were estimated in many ungauged watersheds (DNRC 1990). Groundwater availability was determined using available data and knowledge of local aquifer characteristics and, in the case of the Sheridan County Conservation District, a report by the Montana Bureau of Mines and Geology (Donovan ~~1986~~ 1988).

On page 50 of the draft EIS, the following change has been made:

Figure 4-11. Total Dissolved Solids ~~Suspended sediment~~ data for the East Poplar River at International boundary for period 1981-90



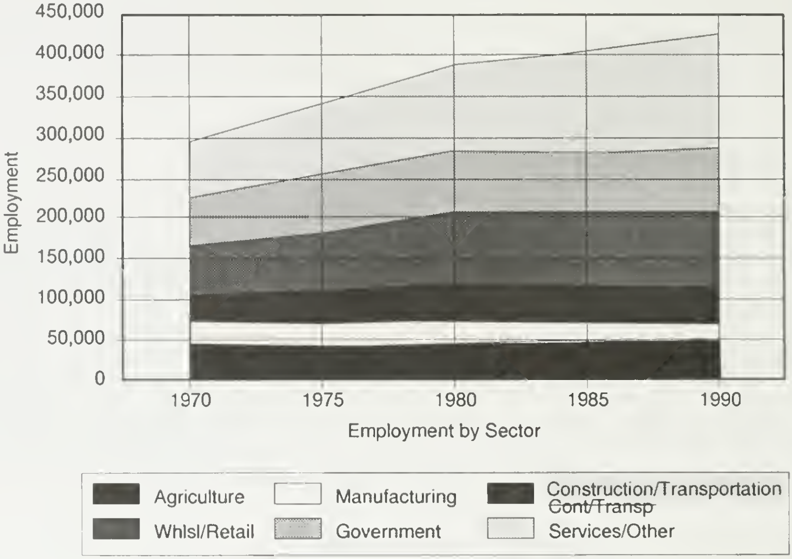
Source: Poplar River Bilateral Monitoring Committee 1991

On page 83 of the draft EIS, the following change has been made:

Employment trends in the lower Missouri River basin over the past 20 years differ markedly from statewide trends (Figure 4-19). Total employment peaked in 1980 at the height of the oil boom and has declined by 17 percent since that time. Service, finance, and other non-agricultural sector employment increased by 34 percent between 1970 and 1990 and comprised 27 percent of total employment in the basin by 1990. Over this same period, basin natural resources (agriculture and oil) and manufacturing employment declined by nearly 20 percent, while wholesale and retail trade employment increased slightly. Government employment in the lower Missouri River basin increased by about 11 percent between 1970 and 1990. Employment in the other economic sectors in the lower Missouri River basin changed very little over the 1970-to-1990 time period.

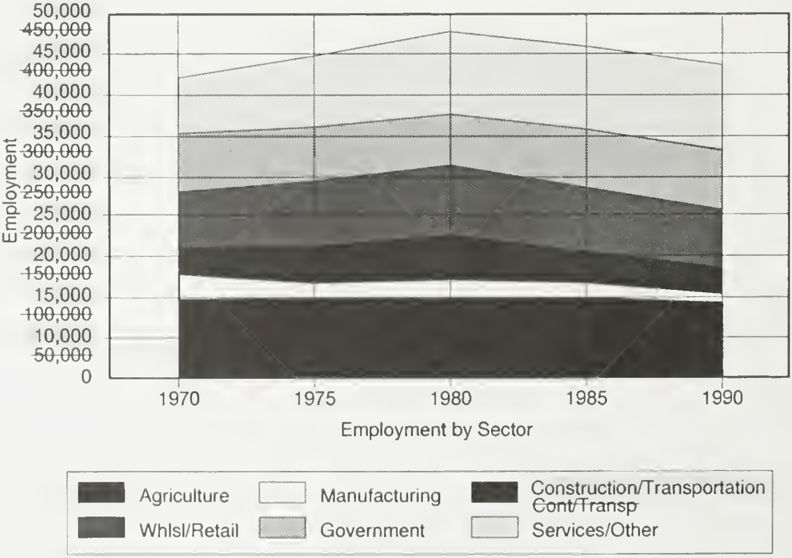
On page 83 of the draft EIS, the following changes have been made:

Figure 4-18. Montana employment trends



On page 84 of the draft EIS, the following changes have been made:

Figure 4-19. Lower Missouri River basin employment trends



On page 87 of the draft EIS, the following changes have been made:

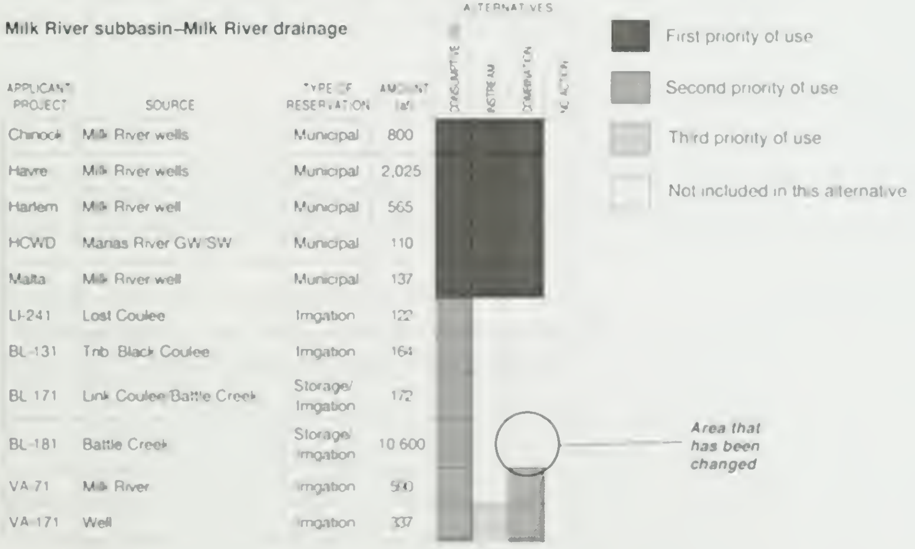
Table 4-22. Economic baseline data - lower Missouri River basin

	Montana			Lower Missouri River Basin			Lower Missouri River Basin Percent of Montana	
Category	Average 1979-81	Average 1989-91	Percent Change	Average 1979-81	Average 1989-91	Percent Change	1979-81	1989-91
Total employment	393,580	429,715	9.2%	43,467	38,918	-10.5%	11.0%	9.1%
Farm employment	35,416	36,996	4.5%	8,513	8,235	-3.3%	24.0%	22.3%
Percent of total	9.0%	8.6%		19.6%	21.2%			
Total personal income ($000)	$10,992,659	$11,901,578	8.3%	$963,056	$970,782	0.8%	8.8%	8.2%
Farm income ($000)	251,648	502,771	99.8%	40,579	132,047	225.4%	16.1%	26.3%
Percent of total	2.3%	4.2%		4.2%	13.6%			
Total ag sales ($000)	$ 2,357,394	$ 1,764,832	-25.1%	$593,174	$408,780	-31.1%	25.2%	23.2%
Livestock sales ($000)	1,322,918	1,036,496	-21.7%	231,470	180,261	-22.1%	17.5%	17.4%
Percent of total	56.1%	58.7%		39.0%	44.1%			
Crop sales ($000)	1,034,476	728,336	-29.6%	361,703	228,519	-36.8%	35.0%	31.4%
~~Crop~~ ~~35.0%~~	~~sales~~ ~~31.4%~~	~~($000)~~	~~1,034,476~~	~~728,336~~	~~-29.6%~~	~~361,703~~	~~228,519~~	~~-36.8%~~
Percent of total	43.9%	41.3%		61.0%	55.9%			

Note. All dollar amounts expressed in terms of 1990 dollars.
Source: U.S.Bureau of Economic Analysis, Regional Economic Information System, Unpublished computerized data. Washington, D.C. 1993

On page 92 of the draft EIS, the following changes have been made:

Table 5-1. Reservation requests included under each alternative



Milk River subbasin–Milk River drainage

APPLICANT PROJECT	SOURCE	TYPE OF RESERVATION	AMOUNT (af)	CONSUMPTIVE	INSTREAM	CONSERVATION	NO ACTION
Chinook	Milk River wells	Municipal	800	■	■	■	
Havre	Milk River wells	Municipal	2,025	■	■	■	
Harlem	Milk River well	Municipal	565	■	■	■	
HCWD	Marias River GW/SW	Municipal	110	■	■	■	
Malta	Milk River well	Municipal	137	■	■	■	
LI-241	Lost Coulee	Irrigation	122	▨			
BL-131	Trib. Black Coulee	Irrigation	164	▨			
BL 171	Link Coulee/Battle Creek	Storage/ Irrigation	172	▨			
BL-181	Battle Creek	Storage/ Irrigation	10,600	▨			
VA 71	Milk River	Irrigation	500	▨		▨	
VA 171	Well	Irrigation	337	▨	░	▨	

■ First priority of use
▨ Second priority of use
░ Third priority of use
☐ Not included in this alternative

Area that has been changed

On page 118 of the draft EIS, the following changes have been made:

Table 6-1. Summary of groundwater availability data, Sheridan County Groundwater Area

Aquifer	Average annual withdrawal (af) (1983-1988)	Maximum annual withdrawal (af) (1988)	Annual volume permitted by DNRC (af)[g]	Estimated sustainable yield (af)	Volume available (af)
Westby-Dagmar outwash, Coalridge channels, and recharge channels	4,821 af[a]	6,025 af[a]	8,126.45 af[b,g]	6,330 af[a] to 16,000 af[c]	16,000 (high est.) -4,821 (avg. actual use) 11,179 af MAX
Missouri River terrace gravels (preglacial Missouri River)	[d]	[d]	299 af[b,g]	2,000 af[e]	1,701 af[e]
Tributary outwash	[d]	[d]	0 af[b,g]	2,000 af[e]	2,000 af[e]
Big Muddy alluvium	[d]	[d]	625 af[b,g]	2,300 af[f]	1,675 af

[a] From MBMG (Donovan 1988)
[b] DNRC
[c] Sheridan County Water Reservation Application (Gallagher 1986)
[d] Reliable estimates are not available
[e] These channels are about the same size as Big Muddy Creek.
[f] DNRC 1990
[g] Total of ~~large~~ irrigation projects diverting more than 100 gpm (DNRC 1993)

On page 123 of the draft EIS, the following changes have been made:

> Reservations ~~would~~ could give reservants ~~legal standing~~ a stronger basis to object to applications for new permits and to changes in senior and junior water rights. ~~Reservants also would have the right to participate in the adjudication process where final decrees have not been issued.~~ If a reservant does not already have standing to object in the adjudication process, a reservation would provide such standing.

On page 146 of the draft EIS, the following change has been made:

LAND USE

LOWER MISSOURI RIVER ~~SUBBASIN~~ BASIN

On page 147 of the draft EIS, the following change has been made:

> Because overall irrigated cropland acreage trends are stable or decreasing (USDA 1989), the increased irrigated cropland acreage resulting from these reservations may displace existing irrigated cropland, which presumably would return to dryland uses. This displacement would be more noticeable for alfalfa cropland acreage. ~~As part of an integrated ranching operation, alfalfa is assumed to be the most profitable crop to be irrigated with reserved water (see Economics).~~ Basin ~~A~~alfalfa production from existing irrigated land is expected to continue to increase substantially from the present average rate of 3.0 tons per acre to 3.9 tons per acre (31 percent increase) in the year 2020 (Figure 6-14). Virtually all Montana alfalfa is produced for cattle feed.

On page 152 of the draft EIS, the following changes have been made:

Poplar River Drainage: In the Poplar River drainage, return flows from proposed irrigation projects would increase flows slightly in October and November. Flows would not change during the winter months. Flows would decrease during the summer unless the Tribes enforce their instream flow rights on the Fort Peck Indian Reservation. About 11 cfs is the minimum thought necessary to protect aquatic habitat in the river above the Fort Peck Indian Reservation. During July, under the Consumptive Use Alternative, flows would cease in the Poplar River above the Fort Peck Indian Reservation in a very dry year (about 1 year in 10) (Table 6-20). During August, flow would cease in the river in dry and very dry years. Under existing conditions, August flow in the Poplar River in dry and very dry years is estimated to be 1 cfs. Although the fish inhabiting the river are adapted to occasional low summer flows, more frequent cessation of flow in conjunction with high summer temperatures and drawdown in some of the pools would further stress the aquatic habitat and fish.

About 3.7 to 4 cfs is thought necessary for aquatic habitat in the West Fork of the Poplar River north of the reservation boundary. Flows in the West Fork of the Poplar River could drop from 0.7 to 0.5 cfs during August in dry years under the Consumptive Use Alternative if downstream instream flow rights are not enforced. At present, August flows cease less than 1 year in 10. More frequent cessation of flow would stress aquatic habitat and fish inhabiting the stream.

On the East Fork of the Poplar River, July flows would be reduced from 3 to about 2.3 cfs in 2 years in 10 under the Consumptive Use Alternative. Roughly 4 cfs is thought to be necessary in this reach to protect aquatic habitat during the summer.

On page 157 of the draft EIS, the following changes have been made:

Conversion of native ~~rangeland~~ vegetation to irrigated cropland on deer winter range could reduce available ~~forage~~ cover. On winter range with native plant communities, deer browse on shrubs and dried forbs that remain palatable through the winter. Conversion of native shrubland to grow hay or other crops could reduce this winter forage, particularly if crops are harvested late in the season. ~~Losses in native vegetation could stress wildlife during the winter and increase depredation on crops and hay.~~ However, in agricultural areas white-tailed deer will eat crop residues offsetting the loss of native vegetation (Dusek et al. 1989) Acreages of native plant communities that would be converted for proposed irrigation projects are shown in Tables 6-11 through 6-15.

On page 161 of the draft EIS, the following changes have been made:

Under the Montana Antiquities Act, the Department of State Lands would be required to evaluate sites on state land and devise methods to retrieve or protect the information. Under the National Historic Preservation Act and the Archaeological and Historic Preservation Act, the Bureau of Land Management (BLM) or other federal land managing agencies would evaluate sites on federal land or land held in federal trust. Federal review would devise methods to retrieve or protect the information contained at discovered sites. Sites ~~on~~ affecting only private land would not be evaluated unless the landowners have it done, or unless the Board conditions the reservation to require evaluation prior to development. The exception would be burial sites which are protected from disturbance under the Montana Human Remains and Burial Site Protection Act.

On page 166 of the draft EIS, the following changes have been made:

Table 6-33 lists the change in annual value of recreation for the Consumptive Use, Combination, Instream, and No Action alternatives resulting from flow depletions due solely to lower Missouri River basin reservations (Table 6-31). Under the Consumptive Use Alternative, the annual value of recreation would be reduced in the lower Missouri River subbasin by about $314,000/yr, by ~~$10,800/yr~~ an unknown amount ~~in the value~~ in the Little Missouri subbasin, and by $12,500/yr in the Milk River subbasin. Under the Combination Alternative, DNRC estimated that the annual value of recreation in the lower Missouri River subbasin would be decreased by $178,000/yr, an unknown amount ~~$7,600/yr~~ in the Little Missouri River subbasin, and $5,400/yr in the Milk River subbasin. Under the Instream Alternative, DNRC estimated that flow depletions would reduce the annual value of recreation in the lower Missouri River subbasin by $11,000/yr, an unknown amount ~~$2,400/yr~~ in the Little Missouri River subbasin, and $3,600/yr in the Milk River subbasin. There would be no change in the annual value of recreation due to reservations under the No Action Alternative, since no lower Missouri River basin reservations are assumed. It is not known whether the Grant All, Partial Granting, and Coordinated Groundwater Development alternatives for the Sheridan County Groundwater Area would change the annual value of recreation because DNRC could not predict streamflow or water level changes due to proposed water reservations in that area.

On page 168 of the draft EIS, the following changes have been made:

Table 6-32. Changes in annual value of recreation due to reservations granted in the upper Missouri River basin and proposed reservations in the lower Missouri River basin

ALTERNATIVES Subbasin	Changes in July/August recreational values	Changes in Rest of Year recreational values	Changes in Total recreational values
CONSUMPTIVE USE			
Milk	$49,288	$15,234	$64,522
Little Missouri	~~$-6,143~~ unknown	~~$-4,628~~ unknown	~~$-10,771~~ unknown
Lower Missouri	$-476,449	$-116,653	$-593,102
Total			~~$-539,352~~ $-528,581
COMBINATION			
Milk	$45,359	$26,210	$71,569
Little Missouri	~~$-4,929~~ unknown	~~$-2,663~~ unknown	~~$-7,592~~ unknown
Lower Missouri	$-356,801	$-100,781	$-457,582
Total			~~$-393,605~~ $-386,013
INSTREAM			
Milk	$47,502	$25,915	$73,417
Little Missouri	~~$-2,179~~ unknown	~~$-262~~ unknown	~~$-2,441~~ unknown
Lower Missouri	$-202,509	$-87,585	$-290,094
Total			~~$-219,118~~ $-216,677
NO ACTION			
Milk	$48,931	$28,063	$76,993
Little Missouri	$0	$0	$0
Lower Missouri	$-195,365	$-83,779	$-279,144
Total			$-202,151
GAA, PGA, CGDA (a)			
Sheridan County	unknown	unknown	unknown

(a) GAA - Grant All Alternative, PGA - Partial Granting Alternative, CGDA - Coordinated Groundwater Development Alternative

On page 168 of the draft EIS, the following changes have been made:

Table 6-33. Changes in annual value of recreation due to proposed reservations in the lower Missouri River basin

ALTERNATIVES **Subbasin**	**Changes in July/August recreational values**	**Changes in Rest of Year recreational values**	**Changes in Total recreational values**
CONSUMPTIVE USE			
Milk	$357	$-12,829	$-12,472
Little Missouri	~~$-6,143~~ unknown	~~$-4,628~~ unknown	~~$-10,771~~ unknown
Lower Missouri	$-281,083	$-32,875	$-313,958
Total			~~$-337,201~~ $-326,430
COMBINATION			
Milk	$-3,572	$-1,853	$-5,424
Little Missouri	~~$-4,929~~ unknown	~~$-2,663~~ unknown	~~$-7,592~~ unknown
Lower Missouri	$-161,435	$-17,003	$-178,438
Total			~~$-191,454~~ $-183,863
INSTREAM			
Milk	$-1,429	$-2,148	$-3,576
Little Missouri	~~$-2,179~~ unknown	~~$-262~~ unknown	~~$-2,441~~ unknown
Lower Missouri	$-7,143	$-3,807	$-10,950
Total			~~$-16,968~~ $-14,526
NO ACTION			
Milk	$0	$0	$0
Little Missouri	$0	$0	$0
Lower Missouri	$0	$0	$0
Total			$0
GAA, PGA, CGDA (a)			
Sheridan County	unknown	unknown	unknown

(a) GAA - Grant All Alternative, PGA - Partial Granting Alternative, CGDA Coordinated Groundwater Development Alternative

On page 184 of the draft EIS, the following changes have been made:

Table 6-43. Measures that could be adopted to reduce impacts

Type of Impacts	Measures to Reduce Impacts
Irrigation projects conflict with existing land uses, such as residences, highways, and recreation sites	Redesign the project to reduce conflicts, especially on project VA-02.
Diversions for irrigation projects could create hazards to recreational boaters, possibly at project CBI-13	Provide adequate warning to boaters and floaters along river above and below diversion.
Construction crews for large irrigation projects could displace current users at recreation areas used for temporary housing locations	Consultation between project developers and recreation managers and implementation of managers' recommendations
Stream channels could be altered downstream from reservoirs that alter streamflow patterns and trap sediment	Develop a reservoir operation plan which helps to preserve desirable stream channel characteristics.
Sediment would be introduced to streams during construction of dams and/or diversions	Conduct instream construction activities during periods of low flow. Build temporary coffer dams around instream construction sites to limit the transport of sediment.
Fish could be killed in pumps and diversions	Reduce intake velocities below the swimming speed for game fish and species of special concern in the affected stream reach. On the lower Missouri River, use USFWS recommendations to protect the endangered pallid sturgeon, including screening of intakes with 1/4-inch mesh and having intake velocities less than 1/2 ft/sec, or placing intakes at depths of 15 feet or more.
Reductions in flow affecting aquatic habitat in lower Missouri River	Change Fort Peck Reservoir operations to offset summer reductions.
Historical, archaeological, or paleontological resources could be destroyed or important information lost as a result of project construction	1) Have known sites evaluated by a person qualified to determine site significance. This may involve consultation with Indian tribes, state and federal land managers, and the State Historic Preservation Office. 2) Survey projects proposed on undisturbed land areas having high potential for site discovery, or where site density is high for the presence of sites prior to project development and have site significance determined by a qualified person. 3) Avoid significant sites by project construction and operation wherever possible by adjusting location of equipment and field boundaries. 4) Collect and record information contained where important sites cannot be avoided.
Waterlogging of soils due to poor soil drainage	Install artificial drainage systems to facilitate soil drainage.
Sediment introduced from construction of projects	Revegetate disturbed areas to reduce erosion.
Decreased soil productivity from mixing soil layers when burying pipelines	Double-lift soil during trenching for large pipelines: excavate, store, and replace top 12 inches separate from subsoil. Remove large rocks prior to topsoil replacement.
Soil compaction and/or rutting from heavy equipment used to install pipelines	Retain stubble on working side of pipeline. Suspend construction during wet periods. Conduct post- construction deep ripping of soil along working side of pipeline.

On page 194 of the draft EIS, the following changes have been made:

Table 7-1. Benefits and costs under the alternatives ($ MILLIONS)(a)

	CONSUMPTIVE USE	COMBINATION	INSTREAM	NO ACTION	GAA (b)	PGA (b)	CGDA (b)
IRRIGATION							
Milk	5.18	0.53	0.05	0.00	-	-	-
Little Missouri	1.52	0.42	0.10	0.00	-	-	-
Sheridan County	- (c)	-	-	-	23.88	2.07	3.85
Lower Missouri	18.99	19.87	1.45	0.00	-	-	-
Total	25.69	20.82	1.60	0.00	23.88	2.07	3.85
MUNICIPAL							
Milk	12.20	12.20	12.20	0.00	-	-	-
Little Missouri	0.64	0.64	0.64	0.00	-	-	-
Sheridan County	-	-	-	-	3.67	3.67	3.67
Lower Missouri	26.53	26.53	26.53	0.00	-	-	-
Total	39.36	39.36	39.36	0.00	3.67	3.67	3.67
RECREATION							
Milk	-0.26	-0.11	-0.07	0.00	-	-	-
Little Missouri	~~-0.22~~ unk	~~-0.16~~ unk	~~-0.05~~ unk	0.00	-	-	-
Sheridan County	-	-	-	-	unk	unk	unk
Lower Missouri	-6.55	-3.72	-0.23	0.00	-	-	-
Total	~~-7.04~~ -6.81	~~-4.00~~ -3.84	~~-0.35~~ -0.30	0.00	unk	unk	unk
HYDROPOWER PRODUCTION							
Milk	-	-	-	-	-	-	-
Little Missouri	-	-	-	-	-	-	-
Sheridan County	-	-	-	-	-	-	-
Lower Missouri	-	-	-	-	-	-	-
Downstream	-39.05	-21.94	-2.21	0.00	unk	unk	unk
Total	-39.05	-21.94	-2.21	0.00	unk	unk	unk
REPLACEMENT POWER							
Milk	-0.08	-0.07	-0.02	0.00	-	-	-
Little Missouri	-0.08	-0.07	-0.04	0.00	-	-	-
Sheridan County	-	-	-	-	-3.96	-0.18	-0.47
Lower Missouri	-6.33	-2.98	-0.54	0.00	-	-	-
Total	-6.48	-3.12	-0.60	0.00	-3.96	-0.18	-0.47
TOTAL	**~~12.48~~ 12.71**	**~~31.13~~ 31.29**	**~~37.80~~ 37.85**	**0.00**	**23.59**	**5.56**	**7.06**

(a) Positive numbers represent net benefits and negative numbers represent net costs. All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate. Values represent impacts from just the proposed lower Missouri River basin water reservations.

(b) GAA - Grant All Alternative, PGA - Partial Granting Alternative, CGDA - Coordinated Groundwater Development Alternative

(c) "-" indicates category does not apply in the alternative

On page 195 of the draft EIS, the following changes have been made:

than the current rates. The annual difference between the cost of additional power for proposed projects and what applicants would pay for power is shown in Table 6-35. Table 7-1 shows the cost of the subsidy that the ratepayer would pay over 70 years. It would range from $0.78 million under the Instream Flow and Partial Granting alternatives to $10.44 million under the Consumptive Use and Grant All alternatives. Replacement power is assumed to be valued at 5 cents/kWh. There would be no additional replacement power costs under the No Action Alternative.

REDUCED RECREATION

Lower flows also would reduce future water-based recreation below levels that would occur with present flow levels. The annual value of lost recreation due to lower flows under each alternative is shown in Table 6-33. Table 7-1 shows the cost today of 70 years of lost recreation, which would result from the proposed lower Missouri basin water reservations. Excluding the No Action Alternative where costs are zero, costs for lost recreation are highest under the Consumptive Use Alternative (~~$7.04~~ $6.81 million) and lowest under the Instream Alternative (~~$.35~~ $.30 million).

COMPARISON OF BENEFITS AND COSTS FOR DNRC'S ALTERNATIVES

Table 7-1 shows the costs and benefits associated with DNRC's alternatives. All of the alternatives with the exception of the No Action Alternative would increase consumptive use for irrigation and municipalities, result in lower streamflows for recreation and hydropower production and require replacement of electricity used by irrigation and municipal water systems. Assuming that all the water requested for the proposed consumptive use reservations is needed and available, net benefits would be increased by granting the reservations. In other words, the benefits of the consumptive uses exceed the costs of the instream flow losses. The net benefits are highest in the Instream and Grant All alternatives and lowest in the Consumptive Use and Partial Granting alternatives. Analysis of the No Action Alternative, which would grant no reservation requests in the lower Missouri River basin, shows no economic net benefits.

The Grant All, Partial Granting, and Coordinated Groundwater Development alternatives show that the proposed consumptive uses in the Sheridan County Groundwater Area have net benefits. These consumptive uses are likely to affect recreation and hydropower production because groundwater use could affect water levels in lakes and wetlands and flows in Big Muddy Creek and the Missouri River. However, as explained in Chapter Six, DNRC was unable to quantify these changes in flow and, consequently, was unable to quantify economic net costs.

Table 7-2 shows the benefits and costs that would result from reservation of water for municipal and irrigation purposes under each alternative. The costs to recreation and electric generation imposed by increased irrigation exceed the benefits by ~~$25.31~~ $25.08 million under the Consumptive Use Alternative and by ~~$6.67~~ $6.57 million under the Combination Alternative. The high costs are due to the large amounts of water consumed by the irrigation projects in these alternatives. Under the Instream Alternative, however, irrigation benefits exceed costs by ~~$0.01~~ $0.06 million.

Table 7-2. Benefits and costs of reservations for irrigation and municipal uses ($ million)(a)

	Consumptive Use	Combination	Instream	No Action	GAA (b)	PGA (b)	CGDA (b)
Irrigation							
benefits	25.69	20.82	1.60	0.00	23.88	2.07	3.85
costs	~~-51.00~~ -50.77	~~-27.49~~ -27.33	~~-1.59~~ -1.54	0.00	unk	unk	unk
net	~~-25.31~~ -25.08	~~-6.67~~ -6.51	~~0.01~~ 0.06	0.00	unk	unk	unk
Municipal							
benefits	39.36	39.36	39.36	0.00	3.67	3.67	3.67
costs	-1.57	-1.57	-1.57	0.00	unk	unk	unk
net	37.79	37.79	37.79	0.00	unk	unk	unk

(a) Positive numbers represent net benefits and negative numbers represent net costs.
All figures are the value today of 70 years of future impacts based on a 4.6 percent real discount rate.

(b) GAA - Grant All Alternative, PGA - Partial Granting Alternative, CGDA - Coordinated Groundwater Development Alternative

In Appendix G of the draft EIS, the headings for table G-1 have been clarified as follows:

Table G-1. Existing land use on lands proposed for irrigation projects (acres)

Conservation District Project	Total Project Size (proposed irrigated acreage)	Existing Irrigation	Dryland Grain	Dryland Hay	Dryland Range	Riparian Range

In Appendix J of the draft EIS, the following introductory text has been added:

Four of the DFWP flow requests exceeded the amount that can be granted by the Board of Natural Resources and Conservation. The reduced flow requests are presented in Table J-1. The flows remaining after DFWP instream flow requests are subtracted are presented in Table J-2.

Table J-1. Reduced DFWP flow requests

	Missouri #7		Missouri #8		Redwater #2		Little Beaver Creek	
Month	cfs	af	cfs	af	cfs	af	cfs	af
Oct	5035	309596	5536	340412	4	246	3	184
Nov	4878	290233	5560	330821	4	238	3	179
Dec	2926	179893	4175	256689	2	123	3	184
Jan	2546	156539	3900	239783	2	123	3	184
Feb	2262	126743	3551	198975	2	111	3	167
Mar	2537	155996	3999	245897	2(192)	123(11784)	3(277)	184(13929)
Apr	5341	317801	4679	278445	4	238	3	179
May	7255	446091	7926	487351	4	246	3	184
Jun	8159	485502	9278	552050	4	238	3	179
Jul	4130	253922	4183	257205	4	246	3	184
Aug	4265	262217	4511	277370	4	246	3	184
Sep	4688	278968	4764	283503	4	238	3	179
TOTAL		3263500		3748500		14200		16100

Numbers in parenthesis indicate channel maintenance requests for spring runoff flows The requests are not constrained to a particular month, but are designed to coincide with snowmelt runoff.

The methods used to compute the reduced monthly flow distribution were suggested by DFWP (Spence 1994). The flow reduction on the Missouri River was computed by distributing the required annual flow proportionately so that the largest reductions are in high flow months and the smallest reductions are in low flow months. Flow reductions on Little Beaver Creek and the Redwater River were removed from the channel maintenance flow request.

In Appendix J of the draft EIS, the following changes have been made

Table ~~J-1~~ J-2. Monthly flows remaining (cfs) during wet (20%), average (50%), and dry (80%) years after DFWP instream reservation requests are subtracted

*

MILK RIVER SUBBASIN

Beaver Creek above Bower Lake near Havre

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	5	5	4	1	6	26	32	119	67	24	6	3
50th %	0	0	0	0	1	11	16	16	31	4	0	0
80th %	0	0	0	0	0	1	7	11	12	0	0	0

Little Boxelder Creek at mouth at Clear Creek road, near Havre

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	2	2	1	0	5	17	16	17	14	6	1	0
50th %	0	0	0	0	0	5	4	2	2	0	0	0
80th %	0	0	0	0	0	2	0	0	0	0	0	0

Clear Creek at Clear Creek Road crossing, near Lohman

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	0	0	0	0	1	29	18	27	22	5	0	0
50th %	0	0	0	0	0	4	1	1	1	0	0	0
80th %	0	0	0	0	0	0	0	0	0	0	0	0

Battle Creek near international boundary

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	0.3	0.3	1.9	0.5	32.5	103.7 (0)	70.8 (0)	87.2	62.3	22.8	0	0
50th %	0	0	0	0	3.2	32.4 (0)	12.6 (0)	9.7	12	0	0	0
80th %	0	0	0	0	0	10.0 (0)	1.6 (0)	0	0	0	0	0

Battle Creek at mouth, near Chinook

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	11	5	5	0	12	91 (0)	80 (0)	111	42	21	3	2
50th %	0	0	0	0	0	13 (0)	26 (0)	29	16	7	0	0
80th %	0	0	0	0	0	0	0	0	0	0	0	0

Peoples Creek at Barney Olsen Road, near Dodson

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	1	1	1	0	5	17	17	16	19	7	1	0
50th %	0	0	0	0	0	6	6	3	5	1	0	0
80th %	0	0	0	0	0	1	3	0	0	0	0	0

Beaver Creek at Ft. Belknap Indian Reservation, near Zortman

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	0.3	0.8	0.3	0.1	0.1	0.3	0.8	1.8	2.8	0.8	0.8	0.3
50th %	0.2	0.3	0.1	0	0	0.3	0.3	0.3	0.8	0.3	0.3	0.2
80th %	0.1	0.1	0	0	0	0.1	0.1	0	0	0.1	0	0

Beaver Creek at mouth, near Saco

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	27	7	6	1	51	332 (182)	214	632	196	118	18	10
50th %	0	0	0	0	2	73 (0)	14 (0)	80	24	16	3	0
80th %	0	0	0	0	0	14 (0)	0	7	0	0	0	0

Frenchman Creek at mouth, near Saco

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	7	5	4	1	4	179 (0)	681 (483)	172	80	29	6	2
50th %	0	0	0	0	0	67 (0)	212 (0)	49	14	6	0	0
80th %	0	0	0	0	0	9 (0)	42 (0)	10	0	0	0	0

Rock Creek at mouth, near Saco

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	5	2	3	1	9	736 (345)	1122	156	107	51	2	0
50th %	0	0	1	0	0	149 (0)	231 (0)	38	26	5	0	0
80th %	0	0	0	0	0	16 (0)	51 (0)	12	6	0	0	0

LOWER MISSOURI SUBBASIN

Missouri River below Fort Peck

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	10265	8222	8374	10054	11538	8563	4959	4645	4441	9070	13835	13612
50th %	5265	4132	6394	7314	5978	5083	1899	0	0	5970	7835	8712
80th %	275	0	2524	2124	558	943	0	0	0	1490	3305	1672

Missouri River near Wolf Point

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	10564	7540	7125	8700	10449	9101	10721	5874	3822	9117	12889	13636
50th %	4664	3450	4845	5880	5479	4981	4501	34	0	5737	7489	6736
80th %	0	0	1375	1250	0	521	2211	0	0	2017	3229	2156

~~Missouri River below Fort Peck~~

~~MONTH~~	~~OCT~~	~~NOV~~	~~DEC~~	~~JAN~~	~~FEB~~	~~MAR~~	~~APR~~	~~MAY~~	~~JUN~~	~~JUL~~	~~AUG~~	~~SEP~~
~~20th %~~	~~8300~~	~~6100~~	~~4300~~	~~5600~~	~~6800~~	~~5100~~	~~2500~~	~~1932~~	~~1600~~	~~5400~~	~~10300~~	~~10500~~
~~50th %~~	~~3300~~	~~2010~~	~~2320~~	~~2860~~	~~1240~~	~~1620~~	~~0~~	~~0~~	~~0~~	~~2300~~	~~4300~~	~~3600~~
~~80th %~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~

~~Missouri River near Wolf Point~~

~~MONTH~~	~~OCT~~	~~NOV~~	~~DEC~~	~~JAN~~	~~FEB~~	~~MAR~~	~~APR~~	~~MAY~~	~~JUN~~	~~JUL~~	~~AUG~~	~~SEP~~
~~20th %~~	~~9100~~	~~6100~~	~~4300~~	~~5600~~	~~7000~~	~~6100~~	~~8400~~	~~3752~~	~~1600~~	~~6300~~	~~10400~~	~~11400~~
~~50th %~~	~~3200~~	~~2010~~	~~2020~~	~~2780~~	~~2030~~	~~1980~~	~~2180~~	~~0~~	~~0~~	~~2920~~	~~5000~~	~~4500~~
~~80th %~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~740~~	~~0~~

Redwater River above confluence of EF Redwater, near Vida

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	3	1	2	0	65 (0)	219 (101)	59	31	98	49	3	1
50th %	0	0	1	0	1 (0)	75 (0)	21 (0)	8	10	3	0	0
80th %	0	0	0	0	0	12 (0)	6 (0)	2	1	0	0	0

Redwater River near Vida

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	3	1	2	0	81 (0)	~~272 (140)~~ 272 (154)	73	39	121	60	3	0
50th %	0	0	1	0	2 (0)	93 (0)	26 (0)	10	12	3	0	0
80th %	0	0	0	0	0	15 (0)	8 (0)	2	1	0	0	0

West Fork Poplar River at Fort Peck Reservation boundary, near Richland

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	4	4	3	1	3	86	97 (0)	13 (0)	21	8	2	1
50th %	2	2	1	0	0	37	9 (0)	0	10	2	0	0
80th %	0	0	0	0	0	11	0	0	4	0	0	0

Poplar River above confluence of East Fork Poplar River, near Scobey

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	4	4	3	1	3	206	323 (210)	27	29	8	1	1
50th %	2	2	1	0	0	61	30 (0)	0	11	2	0	0
80th %	0	0	0	0	0	12	0	0	3	0	0	0

East Fork Poplar River at mouth, near Scobey

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	0	0	1	1	2 (0)	71 (19)	148	27	22	2	1	0
50th %	0	0	1	1	1 (0)	2 (0)	0	5	1	0	0	0
80th %	0	0	0	0	0	1 (0)	0	0	0	0	0	0

Poplar River at Fort Peck reservation boundary near Scobey

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	10	11	7	1	7	290	373 (238)	49	62	20	3	2
50th %	5	5	1	0	0	114	49 ([illegible])	2 ([illegible])	28	5	0	0
80th %	0	0	0	0	0	31	[illegible]	[illegible]	9	0	0	0

~~Missouri River near Culbertson~~

~~MONTH~~	~~OCT~~	~~NOV~~	~~DEC~~	~~JAN~~	~~FEB~~	~~MAR~~	~~APR~~	~~MAY~~	~~JUN~~	~~JUL~~	~~AUG~~	~~SEP~~
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	~~0~~	~~0~~	[illegible]	[illegible]	[illegible]
[illegible]	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	[illegible]	~~0~~	~~0~~	~~0~~	[illegible]	[illegible]

Missouri River near Culbertson (DFWP)

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	10964	7340	7325	8800	10949	10701	12221	6774	4522	9217	12589	13436
50th %	4864	3460	4566	5130	5660	6401	5921	544	0	5737	7089	6836
80th %	134	0	1366	1160	0	1291	2751	0	0	2237	3079	2336

LITTLE MISSOURI SUBBASIN

Little Missouri River at Camp Crook, S D

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	10	[illegible]	2	1	34	608 (145)	524	631	782	111	63	45
50th %	0	[illegible]	0	[illegible]	1	187 ([illegible])	64 ([illegible])	63	222	38	8	[illegible]
80th %	0	[illegible]	0	[illegible]	0	33 ([illegible])	18 ([illegible])	9	14	6	[illegible]	[illegible]

Boxelder Creek at Webster

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	5	1	2	2	44	394 (119)	278	248	256	65	30	20
50th %	0	0	0	[illegible]	1	91 ([illegible])	51 ([illegible])	41	176	25	3	[illegible]
80th %	0	0	0	[illegible]	0	17 ([illegible])	10 ([illegible])	8	18	0	0	[illegible]

Little Beaver Creek near Marmarth, N D

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
~~20th %~~	3	4	0	1	43	~~[illegible]~~ 263 (36)	~~[illegible]~~ 130	46	135	34	6	11
50th %	0	0	0	[illegible]	0	49 ([illegible])	25 ([illegible])	13	50	12	[illegible]	[illegible]
80th %	0	0	0	0	0	11 ([illegible])	6 ([illegible])	3	12	1	[illegible]	[illegible]

Beaver Creek at Wibaux

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	1.39	1.17	0.3	0.25	26.88	271.9 (148)	151.2	[illegible]	33.6	[illegible]	2	[illegible]
50th %	0	0.36	0	0	[illegible]	35.4 ([illegible])	13.3 ([illegible])	4.5	5.3	2.2	[illegible]	[illegible]
80th %	0	0	0	[illegible]	[illegible]	3.7 ([illegible])	3.5 ([illegible])	[illegible]	[illegible]	[illegible]	0	[illegible]

Beaver Creek near Trotters, N D

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
20th %	1.3	1.3	1	1	62	[illegible] (303)	139.3	23.3	54.3	74.3	2.3	[illegible]
50th %	0	0	0	0	4	[illegible]	22.3 ([illegible])	7.3	9.3	4.3	0	[illegible]
80th %	0	0	0	0	[illegible]	13 ([illegible])	6.3 ([illegible])	[illegible]	2.3	0	0	[illegible]

* Numbers in parentheses are an estimate of monthly [illegible] that would remain after DFWP requested channel maintenance flows are subtracted

Sources DFWP 1991 and DNRC 1991

In Appendix L of the draft EIS, the following changes have been made:

Table L-1. Comparison of water values for consumptive use (assuming alfalfa production) and instream use ($/acft)

	50 MILL (5 CENTS) PER KILOWATT HOUR REPLACEMENT COST									100 MILL (10 CENTS) PER KILOWATT HOUR REPLACEMENT COST								
	CONSUMPTIVE VALUE				INSTREAM	CONSUMPTIVE VALUE MINUS INSTREAM VALUE				CONSUMPTIVE VALUE				INSTREAM	CONSUMPTIVE VALUE MINUS INSTREAM VALUE			
Subbasin Drainage Project	10/10	8/10	6/10	4/10	VALUE	10/10	8/10	6/10	4/10	10/10	8/10	6/10	4/10	VALUE	10/10	8/10	6/10	4/10
LITTLE MISSOURI (1)																		
LittleMissouri																		
CT-011	20.48	9.17	-0.74	-11.69	~~29.68~~	~~-9.21~~	~~-20.51~~	~~-30.42~~	~~-41.37~~	0.18	-11.13	-21.04	-31.99	~~55.64~~	~~-55.47~~	~~-66.77~~	~~-76.69~~	~~-87.64~~
					25.96	-5.49	-16.79	-26.70	-37.65					51.92	-51.75	-63.05	-72.97	-83.92
CT-012WS	6.76	-8.48	-18.74	-33.16	~~29.68~~	~~-22.92~~	~~-38.16~~	~~-48.42~~	~~-62.84~~	6.76	-8.48	-18.74	-33.16	~~55.64~~	~~-48.88~~	~~-64.12~~	~~-74.38~~	~~-88.80~~
					25.96	-19.20	-34.44	-44.70	-59.12					51.92	-45.16	-60.40	-70.66	-85.08
CT-131	33.73	22.59	12.84	2.06	~~29.68~~	~~4.05~~	~~-7.09~~	~~-16.84~~	~~-27.62~~	16.26	5.12	-4.64	-15.42	~~55.64~~	~~-39.38~~	~~-50.53~~	~~-60.28~~	~~-71.06~~
					25.96	7.77	-3.37	-13.12	-23.90					51.92	-35.66	-46.81	-56.56	-67.34
CT-141WS	32.47	18.24	6.01	-8.99	~~29.68~~	~~2.79~~	~~-11.44~~	~~-23.67~~	~~-38.68~~	32.47	18.24	6.01	-8.99	~~55.64~~	~~-23.17~~	~~-37.41~~	~~-49.63~~	~~-64.64~~
					25.96	6.51	-7.72	-19.95	-34.96					51.92	-19.45	-33.69	-45.91	-60.92
CT-161WS	33.94	18.99	6.15	-9.60	~~29.68~~	~~4.26~~	~~-10.69~~	~~-23.53~~	~~-39.28~~	33.94	18.99	6.15	-9.60	~~55.64~~	~~-21.70~~	~~-36.65~~	~~-49.49~~	~~-65.24~~
					25.96	7.98	-6.97	-19.81	-35.56					51.92	-17.98	-32.93	-45.77	-61.52
CT-162WS	32.73	18.31	5.93	-9.26	~~29.68~~	~~3.04~~	~~-11.37~~	~~-23.75~~	~~-38.94~~	32.73	18.31	5.93	-9.26	~~55.64~~	~~-22.92~~	~~-37.33~~	~~-49.71~~	~~-64.90~~
					25.96	6.76	-7.65	-20.03	-35.22					51.92	-19.20	-33.61	-45.99	-61.18
CT-181WS	21.53	6.62	-3.42	-17.53	~~29.68~~	~~-8.15~~	~~-23.06~~	~~-33.11~~	~~-47.22~~	21.53	6.62	-3.42	-17.53	~~55.64~~	~~-34.11~~	~~-49.02~~	~~-59.07~~	~~-73.18~~
					25.98	-4.43	-19.34	-29.39	-43.50					51.92	-30.39	-45.30	-55.35	-69.46
CT-191	2.27	-6.61	-13.87	-22.01	~~29.68~~	~~-27.42~~	~~-36.29~~	~~-43.56~~	~~-51.70~~	-13.70	-22.58	-29.84	-37.98	~~55.64~~	~~-69.34~~	~~-78.22~~	~~-85.48~~	~~-93.62~~
					25.96	-23.70	-32.57	-39.84	-47.98					51.92	-65.62	-74.50	-81.76	-89.90
CT-241	19.69	7.32	-3.45	-15.56	~~29.68~~	~~-9.99~~	~~-22.36~~	~~-33.13~~	~~-45.24~~	3.81	-8.56	-19.32	-31.44	~~55.64~~	~~-51.83~~	~~-64.20~~	~~-74.97~~	~~-87.08~~
					25.96	-6.27	-18.64	-29.41	-41.52					51.92	-48.11	-60.48	-71.25	-83.36
CT-243WS	32.69	18.28	5.90	-9.30	~~29.68~~	~~3.01~~	~~-11.40~~	~~-23.79~~	~~-38.98~~	32.69	18.28	5.90	-9.30	~~55.64~~	~~-22.96~~	~~-37.37~~	~~-49.75~~	~~-64.94~~
					25.96	6.73	-7.68	-20.07	-35.26					51.92	-19.24	-33.65	-46.03	-61.22
CT-244WS	33.33	18.71	6.15	-9.27	~~29.68~~	~~3.64~~	~~-10.98~~	~~-23.54~~	~~-38.95~~	33.33	18.71	6.15	-9.27	~~55.64~~	~~-22.32~~	~~-36.94~~	~~-49.50~~	~~-64.91~~
					25.96	7.36	-7.26	-19.82	-35.23					51.92	-18.60	-33.22	-45.78	-61.19
BoxelderCreek																		
CT-121	6.28	-5.24	-14.62	-25.46	~~29.68~~	~~-23.40~~	~~-34.92~~	~~-44.30~~	~~-55.14~~	6.28	-5.24	-14.62	-25.46	~~55.64~~	~~-49.36~~	~~-60.89~~	~~-70.26~~	~~-81.10~~
					25.96	-19.68	-31.20	-40.58	-51.42					51.92	-45.64	-57.17	-66.54	-77.38
CT-122WS	9.02	-4.70	-16.49	-30.96	~~29.68~~	~~-20.66~~	~~-34.38~~	~~-46.18~~	~~-60.64~~	9.02	-4.70	-16.49	-30.96	~~55.64~~	~~-46.62~~	~~-60.35~~	~~-72.14~~	~~-86.60~~
					25.96	-16.94	-30.66	-42.46	-56.92					51.92	-42.90	-56.63	-68.42	-82.88
CT-151WS	31.25	17.42	5.53	-9.05	~~29.68~~	~~1.57~~	~~-12.26~~	~~-24.15~~	~~-38.73~~	31.25	17.42	5.53	-9.05	~~55.64~~	~~-24.39~~	~~-38.23~~	~~-50.11~~	~~-64.70~~
					25.96	5.29	-8.54	-20.43	-35.01					51.92	-20.67	-34.51	-46.39	-60.98
CT-152WS	29.74	16.53	5.18	-8.75	~~29.68~~	~~0.06~~	~~-13.15~~	~~-24.50~~	~~-38.43~~	29.74	16.53	5.18	-8.75	~~55.64~~	~~-25.91~~	~~-39.12~~	~~-50.46~~	~~-64.39~~
					25.96	3.78	-9.43	-20.78	-34.71					51.92	-22.19	-35.40	-46.74	-60.67
CT-153WS	30.22	16.77	5.22	-8.96	~~29.68~~	~~0.54~~	~~-12.91~~	~~-24.47~~	~~-38.64~~	30.22	16.77	5.22	-8.96	~~55.64~~	~~-25.42~~	~~-38.87~~	~~-50.43~~	~~-64.61~~
					25.96	4.26	-9.19	-20.75	-34.92					51.92	-21.70	-35.15	-46.71	-60.89
CT-154WS	32.49	18.08	5.69	-9.50	~~29.68~~	~~2.80~~	~~-11.61~~	~~-23.99~~	~~-39.18~~	32.49	18.08	5.69	-9.50	~~55.64~~	~~-23.16~~	~~-37.57~~	~~-49.95~~	~~-65.14~~
					25.96	6.52	-7.89	-20.27	-35.46					51.92	-19.44	-33.85	-46.23	-61.42
CT-171WS	18.88	4.35	-5.44	-19.19	~~29.68~~	~~-10.80~~	~~-25.33~~	~~-35.12~~	~~-48.87~~	18.88	4.35	-5.44	-19.19	~~55.64~~	~~-36.76~~	~~-51.29~~	~~-61.08~~	~~-74.84~~
					25.96	-7.08	-21.61	-31.40	-45.15					51.92	-33.04	-47.57	-57.36	-71.12
CT-221	18.86	6.12	-5.29	-17.57	~~29.68~~	~~-10.82~~	~~-23.56~~	~~-34.97~~	~~-47.25~~	-0.62	-13.36	-24.77	-37.05	~~55.64~~	~~-56.27~~	~~-69.00~~	~~-80.41~~	~~-92.70~~
					25.96	-7.10	-19.84	-31.25	-43.53					51.92	-52.55	-65.28	-76.69	-88.98
CT-251	23.34	11.07	0.36	-11.49	~~29.68~~	~~-6.35~~	~~-18.61~~	~~-29.32~~	~~-41.17~~	3.24	-9.02	-19.74	-31.58	~~55.64~~	~~-52.40~~	~~-64.67~~	~~-75.38~~	~~-87.23~~
					25.96	-2.63	-14.89	-25.60	-37.45					51.92	-48.68	-60.95	-71.66	-83.51
CT-261WS	31.65	17.78	5.85	-8.78	~~29.68~~	~~1.97~~	~~-11.91~~	~~-23.83~~	~~-38.46~~	31.65	17.78	5.85	-8.78	~~55.64~~	~~-23.99~~	~~-37.87~~	~~-49.79~~	~~-64.42~~
					25.96	5.69	-8.19	-20.11	-34.74					51.92	-20.27	-34.15	-46.07	-60.70
CT-262WS	43.83	24.61	8.10	-12.15	~~29.68~~	~~14.14~~	~~-5.07~~	~~-21.58~~	~~-41.83~~	43.83	24.61	8.10	-12.15	~~55.64~~	~~-11.82~~	~~-31.03~~	~~-47.54~~	~~-67.79~~
					25.98	17.86	-1.35	-17.86	-38.11					51.92	-8.10	-27.31	-43.82	-64.07
CT-310WS	31.59	17.86	6.07	-8.40	~~29.68~~	~~1.91~~	~~-11.82~~	~~-23.61~~	~~-38.08~~	31.59	17.86	6.07	-8.40	~~55.64~~	~~-24.06~~	~~-37.78~~	~~-49.57~~	~~-64.04~~
					25.96	5.63	-8.10	-19.89	-34.36					51.92	-20.34	-34.06	-45.85	-60.32
CT-320	-4.97	-24.17	-40.29	-58.64	~~29.68~~	~~-34.66~~	~~-53.85~~	~~-69.97~~	~~-88.32~~	-10.32	-29.51	-45.63	-63.99	~~55.64~~	~~-65.96~~	~~-85.15~~	~~-101.28~~	~~-119.63~~
					25.96	-30.94	-50.13	-66.25	-84.60					51.92	-62.24	-81.43	-97.56	-115.91

CT 330	34.88	23.13	13.16	1.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34.88	23.13	13.16	1.95	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	8.92	2.83	12.80	-24.01					51.92	17.05	-28.79	-38.77	-49.97
CT 370	16.02	3.44	-7.86	-20.03	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.02	3.44	7.86	-20.03	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-9.94	-22.52	-33.82	-45.99					51.92	-35.90	-48.48	-59.78	-71.95
CT 380	-5.27	-16.68	-26.54	-37.49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-5.27	-18.68	-26.54	-37.49	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-31.23	-42.64	-62.50	-83.45					51.92	-57.19	-68.60	-78.47	-89.41
LittleBeaverCreek																		
LB-061WS	29.94	16.53	5.01	-9.12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29.94	16.53	5.01	-9.12	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	3.97	-9.43	-20.95	-35.08					51.92	-21.99	-35.30	-48.91	-61.04
LB-063WS	32.18	17.77	5.39	-9.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.18	17.77	5.39	-9.80	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	8.22	-8.19	-20.57	-35.76					51.92	-19.74	-34.15	-48.53	-61.73
LB-083WS	29.31	15.97	4.50	-9.56	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29.31	15.97	4.50	-9.56	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	3.35	-9.99	-21.48	-35.52					51.92	-22.61	-35.96	-47.42	-61.49
LB-141WS	17.63	3.22	-8.49	-20.13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.63	3.22	-8.49	20.13	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-8.33	-22.74	-32.45	-46.09					51.92	-34.29	-48.70	-58.41	-72.06
LB-151WS	27.46	13.93	2.32	-11.94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.46	13.93	2.32	11.94	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	1.49	12.03	-23.64	-37.90					51.92	24.47	-37.99	-49.61	-63.86
LB 181WS	26.76	15.02	4.93	7.45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26.76	15.02	4.93	7.45	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	0.80	10.94	-21.03	-33.41					51.92	-25.18	-38.90	-48.99	-59.37
LB 182WS	27.12	15.11	4.80	7.86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.12	15.11	4.80	7.86	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	1.16	10.85	21.18	-33.82					51.92	-24.80	36.81	-47.13	59.78
CT 041WS	16.96	3.23	6.03	19.03	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.96	3.23	-6.03	-19.03	55.64	38.68	[illegible]	-61.67	74.67
					25.96	-9.00	-22.73	-31.99	-44.99					51.92	-34.96	-48.70	-57.95	-70.95
CT 071	59.66	40.29	23.90	5.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.66	40.29	23.90	5.07	55.64	4.02	15.35	31.74	50.58
					25.96	33.70	14.33	-2.06	-20.90					51.92	7.74	-11.63	-28.02	-46.86
CT 291WS	30.39	16.66	4.87	9.60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.39	16.66	4.87	-9.60	55.64	[illegible]	38.98	-50.77	-65.24
					25.96	4.43	-9.30	-21.09	-35.56					51.92	-21.54	-35.26	-47.05	-61.52
CT 293WS	35.00	16.99	5.24	11.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35.00	18.99	5.24	-11.64	55.64	20.64	38.65	50.41	-67.29
					25.96	9.04	-8.97	-20.73	-37.81					51.92	-18.92	-32.93	-46.69	-63.57
CT 294	14.88	[illegible]	-49.63	67.86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29.50	-48.31	-64.25	82.49	55.64	-85.15	103.95	-119.89	138.13
					25.96	-40.84	-59.65	-75.59	-93.83					51.92	-81.43	-100.23	-118.17	134.41
CT 301WS	4.79	18.90	-28.40	-41.76	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-4.79	18.90	-28.40	-41.76	55.64	-60.43	74.54	-84.05	97.40
					25.96	-30.75	-44.86	-54.37	-67.72					51.92	-56.71	-70.82	-80.33	93.68
CT-341WS	18.51	3.71	-6.27	-20.27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.51	3.71	-6.27	20.27	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-7.45	-22.26	-32.23	-46.24					51.92	-33.42	-48.22	-58.19	-72.20
BeaverCreek																		
WI-41WS	7.46	-3.89	13.65	-25.61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.46	-3.89	-13.65	-25.61	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-18.50	-29.85	-39.81	-51.58					51.92	-44.46	-55.81	-65.57	-77.54
WI-42WS	2.92	-14.99	-23.12	-34.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.92	-14.99	-23.12	-34.55	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-28.88	-40.95	-49.08	-60.51					51.92	-54.84	-66.91	75.05	-86.47
WI-43WS	25.52	14.05	4.20	-7.89	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25.52	14.05	4.20	7.89	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-0.44	11.91	21.76	33.85					51.92	-26.41	37.87	-47.72	59.81
WI-61WS	18.21	4.68	-5.23	-17.38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.21	4.68	-5.23	-17.38	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-9.78	-21.28	-31.19	-43.34					51.92	-35.72	-47.25	-57.15	-69.30
WI-71WS	24.49	13.28	3.65	8.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24.49	13.28	3.65	8.17	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-1.48	-12.68	22.31	-34.13					51.92	-27.44	38.65	-48.28	-60.09
WI-72WS	23.99	13.01	3.57	8.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	23.99	13.01	3.57	-8.00	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	1.98	12.96	-22.39	-33.96					51.92	-27.94	38.92	-48.35	[illegible]
WI-73WS	3.96	15.64	23.50	-34.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.96	15.64	-23.50	-34.55	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	-29.92	41.60	49.46	-60.51					51.92	-55.89	-67.58	-75.42	-86.47
WI-74WS	10.75	-0.45	-10.08	-21.90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.75	-0.45	-10.08	-21.90	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	15.21	26.42	36.05	-47.86					51.92	-41.17	-52.38	-62.01	73.82
WI-75WS	10.04	-1.11	-10.68	-22.43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.04	1.11	10.68	-22.43	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	15.92	-27.07	-36.64	-48.39					51.92	-41.89	53.03	-62.60	-74.35
WI-91WS	6.71	4.73	14.56	26.61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.71	-4.73	14.56	-26.61	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	19.25	-30.69	-40.52	52.57					51.92	-45.22	56.65	-66.48	78.54
WI-92WS	10.00	1.10	13.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.00	1.10	13.64	[illegible]	~~55.64~~	[illegible]	[illegible]	[illegible]	[illegible]
					25.96	15.96	27.07	36.60	-48.31					51.92	-41.93	53.03	-62.57	-74.27

WI-93WS	25.80	14.27	4.36	-7.79	~~29.68~~	~~-3.88~~	~~-15.41~~	~~-25.32~~	~~-37.47~~	25.80	14.27	4.36	-7.79	~~55.64~~	~~-29.84~~	~~-41.37~~	~~-51.28~~	~~-63.43~~
					25.96	-0.16	-11.69	-21.60	-33.75					51.92	-26.12	-37.65	-47.56	-59.71
WI-121WS	24.62	13.34	3.65	-8.24	~~29.68~~	~~-5.06~~	~~-16.34~~	~~-26.03~~	~~-37.92~~	24.62	13.34	3.65	-8.24	~~55.64~~	~~-31.03~~	~~-42.30~~	~~-51.99~~	~~-63.88~~
					25.96	-1.34	-12.82	-22.31	-34.20					51.92	-27.31	-38.58	-48.27	-60.16
WI-151WS	16.72	5.58	-3.99	-15.73	~~29.68~~	~~-12.96~~	~~-24.10~~	~~-33.67~~	~~-45.41~~	16.72	5.58	-3.99	-15.73	~~55.64~~	~~-38.93~~	~~-50.06~~	~~-59.63~~	~~-71.38~~
					25.96	-9.24	-20.38	-29.95	-41.69					51.92	-35.21	-46.34	-55.91	-67.66
WI-161WS	7.31	-3.81	-13.37	-25.10	~~29.68~~	~~-22.37~~	~~-33.49~~	~~-43.05~~	~~-54.78~~	7.31	-3.81	-13.37	-25.10	~~55.64~~	~~-48.33~~	~~-59.45~~	~~-69.01~~	~~-80.74~~
					25.96	-18.65	-29.77	-39.33	-51.06					51.92	-44.61	-55.73	-65.29	-77.02
WI-162WS	7.58	-3.95	-13.85	-26.01	~~29.68~~	~~-22.10~~	~~-33.63~~	~~-43.54~~	~~-55.69~~	7.58	-3.95	-13.85	-26.01	~~55.64~~	~~-48.06~~	~~-59.59~~	~~-69.50~~	~~-81.65~~
					25.96	-18.38	-29.91	-39.82	-51.97					51.92	-44.34	-55.87	-65.78	-77.93
WI-171WS	9.57	-1.87	-11.69	-23.75	~~29.68~~	~~-20.11~~	~~-31.55~~	~~-41.37~~	~~-53.43~~	9.57	-1.87	-11.69	-23.75	~~55.64~~	~~-46.07~~	~~-57.51~~	~~-67.33~~	~~-79.39~~
					25.96	-16.39	-27.83	-37.65	-49.71					51.92	-42.35	-53.79	-63.61	-75.67
WI-181WS	7.43	-3.87	-13.58	-25.50	~~29.68~~	~~-22.25~~	~~-33.55~~	~~-43.25~~	~~-55.18~~	7.43	-3.87	-13.58	-25.50	~~55.64~~	~~-48.21~~	~~-59.52~~	~~-69.23~~	~~-81.14~~
					25.96	-18.53	-29.83	-39.54	-51.46					51.92	-44.49	-55.80	-65.51	-77.42
WI-191WS	13.10	1.66	-8.16	-20.22	~~29.68~~	~~-16.58~~	~~-28.02~~	~~-37.84~~	~~-49.90~~	13.10	1.66	-8.16	-20.22	~~55.64~~	~~-42.54~~	~~-53.98~~	~~-63.81~~	~~-75.86~~
					25.96	-12.86	-24.30	-34.12	-46.18					51.92	-38.82	-50.26	-60.09	-72.14
WI-192WS	7.89	-4.11	-14.43	-27.09	~~29.68~~	~~-21.79~~	~~-33.80~~	~~-44.11~~	~~-56.77~~	7.89	-4.11	-14.43	-27.09	~~55.64~~	~~-47.75~~	~~-59.76~~	~~-70.08~~	~~-82.73~~
					25.96	-18.07	-30.08	-40.39	-53.05					51.92	-44.03	-56.04	-66.38	-79.01
WI-201WS	19.04	7.91	-1.65	-13.39	~~29.68~~	~~-10.64~~	~~-21.77~~	~~-31.34~~	~~-43.07~~	19.04	7.91	-1.65	-13.39	~~55.64~~	~~-36.60~~	~~-47.73~~	~~-57.30~~	~~-69.03~~
					25.96	-6.92	-18.05	-27.62	-39.35					51.92	-32.88	-44.01	-53.58	-65.31
WI-202WS	24.08	12.96	3.40	-8.33	~~29.68~~	~~-5.60~~	~~-16.72~~	~~-26.28~~	~~-38.01~~	24.08	12.96	3.40	-8.33	~~55.64~~	~~-31.56~~	~~-42.69~~	~~-52.24~~	~~-63.97~~
					25.96	-1.88	-13.00	-22.56	-34.29					51.92	-27.84	-38.97	-48.52	-60.25
WI-211WS	24.92	13.77	4.20	-7.55	~~29.68~~	~~-4.77~~	~~-15.91~~	~~-25.49~~	~~-37.23~~	24.92	13.77	4.20	-7.55	~~55.64~~	~~-30.73~~	~~-41.87~~	~~-51.45~~	~~-63.19~~
					25.96	-1.05	-12.19	-21.77	-33.51					51.92	-27.01	-38.15	-47.73	-59.47
WI-221WS	7.37	-3.84	-13.47	-25.29	~~29.68~~	~~-22.31~~	~~-33.52~~	~~-43.15~~	~~-54.97~~	7.37	-3.84	-13.47	-25.29	~~55.64~~	~~-48.27~~	~~-59.48~~	~~-69.11~~	~~-80.93~~
					25.96	-18.59	-29.80	-39.43	-51.25					51.92	-44.55	-55.76	-65.39	-77.21
WI-232WS	17.23	6.02	-3.61	-15.42	~~29.68~~	~~-12.45~~	~~-23.66~~	~~-33.29~~	~~-45.10~~	17.23	6.02	-3.61	-15.42	~~55.64~~	~~-38.41~~	~~-49.62~~	~~-59.25~~	~~-71.06~~
					25.96	-8.73	-19.94	-29.57	-41.38					51.92	-34.69	-45.90	-55.53	-67.34
WI-233WS	26.21	14.04	3.58	-9.25	~~29.68~~	~~-3.48~~	~~-15.64~~	~~-26.10~~	~~-38.93~~	26.21	14.04	3.58	-9.25	~~55.64~~	~~-29.44~~	~~-41.61~~	~~-52.06~~	~~-64.89~~
					25.96	0.24	-11.92	-22.38	-35.21					51.92	-25.72	-37.89	-48.34	-81.17
WI-234WS	24.46	13.31	3.73	-8.02	~~29.68~~	~~-5.22~~	~~-16.37~~	~~-25.95~~	~~-37.70~~	24.46	13.31	3.73	-8.02	~~55.64~~	~~-31.18~~	~~-42.33~~	~~-51.91~~	~~-63.67~~
					25.96	-1.50	-12.65	-22.23	-33.98					51.92	-27.46	-38.61	-48.19	-59.95
WI-235WS	SAME AS WI-191																	
WI-236WS	9.68	-1.67	-11.42	-23.39	~~29.68~~	~~-20.00~~	~~-31.35~~	~~-41.11~~	~~-53.07~~	9.68	-1.67	-11.42	-23.39	~~55.64~~	~~-45.96~~	~~-57.31~~	~~-67.07~~	~~-79.04~~
					25.96	-16.28	-27.83	-37.39	-49.35					51.92	-42.24	-53.59	-63.35	-75.32
WI-237WS	7.49	-3.90	-13.68	-25.69	~~29.68~~	~~-22.20~~	~~-33.58~~	~~-43.37~~	~~-55.37~~	7.49	-3.90	-13.68	-25.69	~~55.64~~	~~-48.16~~	~~-59.54~~	~~-69.33~~	~~-81.33~~
					25.96	-18.48	-29.86	-39.65	-51.65					51.92	-44.44	-55.82	-65.61	-77.61
LB-011WS	17.28	2.77	-9.69	-24.98	~~29.68~~	~~-12.41~~	~~-26.91~~	~~-39.37~~	~~-54.66~~	17.28	2.77	-9.69	-24.98	~~55.64~~	~~-38.37~~	~~-52.87~~	~~-65.33~~	~~-80.63~~
					25.96	-8.69	-23.19	-35.65	-50.94					51.92	-34.65	-49.15	-61.61	-76.91
LB-041WS	24.42	12.59	2.43	-10.03	~~29.68~~	~~-5.26~~	~~-17.09~~	~~-27.25~~	~~-39.71~~	24.42	12.59	2.43	-10.03	~~55.64~~	~~-31.23~~	~~-43.05~~	~~-53.21~~	~~-65.67~~
					25.96	-1.54	-13.37	-23.53	-35.99					51.92	-27.51	-39.33	-49.49	-61.95
LB-121WS	10.25	-2.34	-13.16	-26.44	~~29.68~~	~~-19.43~~	~~-32.02~~	~~-42.84~~	~~-56.12~~	10.25	-2.34	-13.16	-26.44	~~55.64~~	~~-45.39~~	~~-57.99~~	~~-68.80~~	~~-82.08~~
					25.96	-15.71	-28.30	-39.12	-52.40					51.92	-41.67	-54.27	-65.08	-78.36
LB-161WS	9.47	-3.72	-12.61	-25.09	~~29.68~~	~~-20.21~~	~~-33.40~~	~~-42.29~~	~~-54.77~~	9.47	-3.72	-12.61	-25.09	~~55.64~~	~~-46.17~~	~~-59.36~~	~~-68.25~~	~~-80.74~~
					25.96	-16.49	-29.68	-38.57	-51.05					51.92	-42.45	-55.64	-64.53	-77.02
LB-171WS	11.02	-1.51	-12.28	-25.49	~~29.68~~	~~-18.66~~	~~-31.19~~	~~-41.96~~	~~-55.17~~	11.02	-1.51	-12.28	-25.49	~~55.64~~	~~-44.62~~	~~-57.16~~	~~-67.92~~	~~-81.13~~
					25.96	-14.94	-27.47	-38.24	-51.45					51.92	-40.90	-53.44	-64.20	-77.41
LB-172WS	25.48	12.67	1.66	-11.84	~~29.68~~	~~-4.20~~	~~-17.01~~	~~-28.02~~	~~-41.52~~	25.48	12.67	1.66	-11.84	~~55.64~~	~~-30.16~~	~~-42.97~~	~~-53.98~~	~~-67.48~~
					25.96	-0.48	-13.29	-24.30	-37.80					51.92	-26.44	-39.25	-50.28	-63.76
LB-191WS	1.03	-11.51	-19.97	-31.85	~~29.68~~	~~-28.65~~	~~-41.20~~	~~-49.65~~	~~-61.53~~	1.03	-11.51	-19.97	-31.85	~~55.64~~	~~-54.61~~	~~-67.16~~	~~-75.61~~	~~-87.49~~
					25.96	-24.93	-37.48	-45.93	-57.81					51.92	-50.89	-63.44	-71.89	-83.77

Table L-3. Municipal water costs

Subbasin Municipality	Proposed Requests Thousands of Gallons/Year	Annual Total Costs	Costs Per Thousand Gallons	Current System Costs Per Thousand Gallons
Milk				
Chinook	65,170.2	$42,776	$0.66	$1.42
Harlem	65,170.2	$56,341	$0.86	$1.81
Havre	154,779.2	$228,554	$1.48	$1.76
Hill County W.D.	35,843.6	$24,742	$0.69	$2.68
Malta	44,641.6	$43,011	$0.96	$0.70
Little Missouri				
Ekalaka	6,517.0	$12,643	$1.94	$1.88
Wibaux	23,005.1	$35,863	$1.56	$1.94
Lower Missouri				
Circle	25,416.4	$36,926	$1.45	$2.08
Culbertson	118,935.6	$34,091	$0.29	$1.04
Fort Peck	32,585.1	$24,328	$0.75	$0.65
Poplar	145,981.2	$34,190	$0.23	$1.15
Wolf Point	164,228.9	$30,854	$0.19	$1.02
Scobey	54,743.0	$20,936	$0.38	$1.45
Sheridan County				
Plentywood	76,575.0	$29,453	$0.38	$0.77

Source: Information based on municipal water reservation applications submitted to DNRC

Table L-4. Instream values ($/af)

Subbasin	Recreational Value (during) July & August	Rest-of-Year	Hydropower Value (assuming) 5 cents/kWh	10 cents/kWh
Milk	5.81	1.63	25.96	51.92
Little Missouri	~~5.81~~ unknown	~~1.63~~ unknown	25.96	51.92
Lower Missouri	5.81	1.63	25.96	51.92
Sheridan County	5.81	1.63	0.00	0.00

LETTERS OF COMMENT RECIEVED AFTER THE APRIL 14, 1994 DEADLINE

05/05/94 14:08 ☎406 487 2851 SOIL CONS SERV

The Daniels County Conservation District commends the Dept. NR & C for their hard work in preparing this draft. Please consider the following comments in your analysis of the Final E.I.S.

P. 94 – Instream flow request at the ½ of the average annual flow would still leave no water for irrigation projects in drier years. Because of year's of economic and social impacts in Daniels County, the Daniels County Conservation District favors the consumptive use alternative.

We feel that the comments in the draft E.I.S. concerning impacts on instream flows by consumptive uses or combination alternatives lack adequate research. The irrigation projects add direct and indirect benefits to the communities as well as compliment good habitat for wildlife. The economic analysis is low compared to the various outlooks on agricultural markets and job markets.

The use of irrigated water on the Poplar River and its fork (mainly the East Fork) is contingent upon the spring flow and apportionment release from the Poplar River Power Project, Cookston reaevoir. On years with low flows and releases, the irrigators limit their uses in late summer due to higher boron and T.D.S. concentrations, thereby maintaining instream flow as needed. The economic benefits of senior users as well as junior users in the spring of the year increases as the flow increases. The increase of cattle and addition of stock dams or water developments within the tributaries has been and continued to be very successful in helping on tax base, community businesses, and improved wildlife habitat.

Refer to comments of pg. 111.

Daniels County Conservation District
District Administrator

Mary Tymofichuk

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931 2nd Ave. N.
Wolf Point, MT 59201
April 14, 1994

Mr. Edward Pettit
Water Management Bureau
Montana DNRC
1520 East Sixth Avenue
P.O. Box 202301
Helena, MT 59620-2301

Dear Sir:

I wish to file a complaint about the Department of Fish and Wildlife's proposal for water reservation in the Missouri Drainage and tributaries.

No tax supported state agency or any state agency should be allowed to compete against the tax paying citizen for use of resources that handicap the ability of the taxpayer.

Yours truly,

Keith Lewis

Little Beaver Conservation District
P.O. Box 917 · Baker, Montana 59313

Chairman Wayne Mangold, Plevna Representative
Vice Chair Dave Meccage, So Fallon County
Dale Funk, No Fallon County
Maurice Tunby, No Fallon County
Darrell Kramlich, Baker Representative
Delbert Schweigert, So Fallon County
Shelley Mackey, So Fallon County
Harold Jensen, Associate Member
Wilbert Schweigert, Associate Member
Allen Rustad, Associate Member
Terry Straub, Associate Member

April 15, 1994

Mr Ed Pettit
Water Management Bureau
Department of Natural Resources and Conservation
1520 East 6th Avenue
PO Box 202301
Helena, Montana 59620-2301

Dear Ed

The Little Beaver Conservation District has the following comments to make on the Little and Lower Missouri River Basin Draft Environmental Impact Statement These comments are in addition too, and concurring with the comments submitted by Roger Perkins of Aquoneering of Laurel, Montana and John E Bloomquist, Attorney for the 11 conservation districts, in behalf of the Little and Lower Missouri River Basin Conservation Districts Water Reservation Council

- The title of the draft EIS is Lower Missouri River Basin Draft EIS - the Little Missouri River Basin is included in the study therefore to make it correct - Little Missouri River Basin should be included in the title
- The irrigation practice "Waterspreading" should be addressed separately from full service irrigation Waterspreading is done before the frost is out of the ground and during snow melt or spring run off ONLY which would be affected by FWP channel maintenance request Waterspreading systems are usually designed for a maximum of 1 5 ac/ft per acre Full service irrigation usually doesn t start until later in the season and throughout the summer requiring larger amounts of water for a longer season of use
- Page S-3 Impacts - The Little Beaver Conservation District feels that monitoring and or using the mouth of stream does not take into consideration to capturing water upstream which would benefit the instream flows later in the season - benefiting the fisheries
- S-5 Historical, Archaeological, and Paleontological Sites Most water development sites are located on private land where formal evaluation of historical, archaeological, and paleontological site is not required to determine if the site might be eligible for listing on the National Register of Historic Places LBCD feels that protecting the private property right is very important and this should not be considered in the deliberating water reservations

When reserved water permit applications are presented to the conservation districts and if there is USDA technical assistance or costshare assistance is provided and if the project is on native range, the SCS is required to do an archeological survey

- Page S-6, 1st para Recreational values for northern and eastern Montana are drastically overstated and do not compare with the Marias/Teton subbasins There are no "blue ribbon" streams in the basin and only one fishing access exists in the basin These figures should not even be considered - if there are no figures available specifically for the Little and Lower Missouri River Basin -it should be stated as such until creditable figures are available
- Page 61 Population decline - The population of the area tends to fluctuate for many reasons Considering the growth of the entire state, especially Western Montana, eastern Montana needs plan for the future Rural life is attractive, people are tired of "city" life and the population will impact the the small, rural frontiers
- Page 123, 7th We believe the right of any reservant to object to senior water rights to be a major impact
- Page 145 The definition of wetlands is not clear and is subject to change at the national level Clarification is needed to make determinations in the water reservation process
- Page 153, 3rd para Spring diversions (waterspreading and dugouts) are a form of storage and should help flows in late July and August
- Page 157, 8th and 9th para The conversion of native rangeland to irrigated cropland does not reduce available forage to deer - it in fact - enhances the wildlife habitat, as well as provides for game birds
- Page 166, Changes in Recreational Value, last para We question the accuracy of Duffield's values and their transposition to Eastern Montana Water based recreation is simply not a high priority in this agricultural based community
- Page 169, 2nd para Why is the Montana DNRC looking out for the interest of downstream states? One of the justifications for the Pick-Sloan program was to provide subsidized power to irrigation users We believe this promise should be kept The EIS should not consider downstream power in the cost-benefit analysis

◇ Page 185, 8th type of Impact - Killing big game to alleviate crop damage "Measures to Reduce Impacts" - "Regulate livestock grazing adjacent to crop fields to allow adequate amounts of forage to sustain wildlife over winter" should not be considered an option - These farm/ranch management decisions are applied to private lands - private property rights must be respected - not regulated!

Respectfully Submitted,

Jan Menger

Jan Menger
District Manager

VALLEY COUNTY
SPORTSMEN'S CLUB
P.O. Box 664 - Glasgow, MT 59230

Missouri River Reservations
Dept. DNRC
1520 east 6th Ave.
PO box 202301
Helena, Montana, 59620

April 6-1994

Dear Missouri River Reservations;

Please accept this as the Valley County Sportsmens Clubs comment concerning the water allocations for the lower Missouri River System.
We hope that in your consideration you take into account the needs of all Fish and Wildlife. We are more than willing to share the resource with other water users but we don't feel its right that all water be allocated for use other than for the Fish and associated Wildlife that depend on a good supply of water.
In particular, the Milk River provides a tremendous amount of recreation for all Montanans. We hope that in your analysis that you allocate some water for the Fish and Wildlife that use this system.

Thank You,
Keith Morehouse, President
Valley County Sportsmens Club

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA NEBRASKA 68102-4978

May 5, 1994

REPLY TO
ATTENTION OF
Planning Division

Mr. Larry Dolan
Montana Department of Natural
Resources and Conservation
Missouri River Reservations
1520 East Sixth Avenue
P.O. Box 202301
Helena, Montana 59620-2301

Dear Mr. Dolan:

We have reviewed the draft environmental impact statement (EIS) on the proposed state of Montana water reservations in the Missouri River Basin below Fort Peck Dam. Our office is forwarding this response as a joint letter with our Missouri River Division (MRD). MRD has operational responsibility for flow releases out of Fort Peck Dam and for regulation of the river down to the mouth near St. Louis, Missouri. Several general comments are provided below, while more detailed comments are enclosed.

As applied to the Missouri River reach from Fort Peck Dam to the North Dakota border, the Omaha District has two major regulatory authorities that can affect or impact water utilization projects from the Missouri River. These are Section 10 of the Rivers and Harbors Act of 1899, which prohibits the obstruction or alteration of navigable waters of the United States without a Federal permit, and Section 404 of the Clean Water Act, which prohibits discharge of dredged or fill material into waters of the United States without a Federal permit. Section 404, but not Section 10, also applies to the basin tributary streams as well as to isolated wetlands.

In the EIS, it would be helpful if you could also explain that water utilization plans in the basin should be forwarded to our Helena Regulatory office in order to determine the type of Federal permit required and if a public interest review is needed. For your information, we are enclosing pamphlet EP 1145-2-1, which further explains the Federal regulatory program.

There are several actions or potential impacts identified in sections of the EIS where we believe it would be appropriate to also document or emphasize the need for a Section 404 permit prior to project construction affecting a waterway or wetland. This is important because potential adverse impacts need to be identified early on so that, through the process, adverse impacts

-2-

to the resource can be avoided or mitigated. These actions are identified in the enclosure with our detailed comments.

Overall, the EIS contains a wealth of resource information about natural resources in the lower Missouri Basin and is generally very comprehensive and well organized. We appreciated the opportunity to review and forward comments, and we apologize for missing the closing date for the public review. Perhaps you will still be able to consider our comments. If you have any questions, please contact Don Becker of my staff at (402) 221-4891.

Sincerely,

Richard D. Gorton
Chief, Environmental
Analysis Branch
Planning Division

Enclosure

LOWER MISSOURI RIVER BASIN EIS
Detailed Comments

Chapter 1, p. 2

Under Table 1-1, the statement on regulated activities should be amended to read "Administers Section 10 permits in navigable waters of the United States and Section 404 permits in Waters of the United States which includes adjacent wetlands; regulates flows from Fort Peck Dam under several Federal authorities for public benefit; and regulates land use on project lands at the Fort Peck Project."

Chapter 2, p.5-6.

We suggest additional language to further expand and clarify the role of the Montana Department of Health and Environmental Sciences (DHES) in the Federal Section 404 Program under the Clean Water Act: "During the Federal review process for a potential dredge or fill project, Section 401 Water Quality Certification must be provided by the DHES or the right waived prior to issuance of a Federal permit for dredge or fill. The review process also includes input from other state and federal agencies before the permit can be issued. Should project-related adverse water quality and related aquatic impacts be identified, avoidance or mitigative measures are typically added prior to permit issuance."

Chapter 3, Fort Peck Reservoir, p. 39, Last Sentence.

A more accurate statement is as follows: "Although the preliminary decree listed as 11,700,000 af/yr at a maximum discharge of 20,000 cfs, this information was provided to the state of Montana by the United States as a matter of comity, for informational purposes only. The U.S. Department of Justice has requested the state water court to include this information in the Final Decree without altering, denying, or restricting the use of control of water related to the project purposes of the Fort Peck Reservoir."

Chapter 3, Review of Missouri River Mainstem Operations, p. 44,

Within paragraph two, last sentence, it should be noted that the Corps also operates the Missouri River system for recreation and fish and wildlife. The authorizing legislation does not designate the latter functions as secondary. The Corps is now pursuing a program of aquatic habitat improvement along many reaches of the river for various rare or declining native species.

The last sentence is not true as water availability for lower basin industries and municipalities is not limiting. Basin

regulation for the current project purposes, including navigation, has resulted in more uniform flow so that water supply intakes, including those intakes used for power plant cooling, are almost always operable.

Chapter 3, Species of Special Concern, Sturgeon Chub/Sicklefin Chub

While these are rare fishes and are more restricted than historically, relatively recent collections in the lower Missouri River (state of Missouri) suggest an increase of populations as compared to the river pre-regulation era (see Pflieger and Grace, "Changes in the Fish Fauna of the Lower Missouri River, 1940-1983," in Community and Evolutionary Ecology of North American Stream Fishes (W.J. Matthews and D. C. Heins, eds., University of Oklahoma Press)).

Chapter 5, Alternatives, p. 92, Table 5-1.

The amount of water reservation for the city of Havre and the Hill City Water District greatly differ on this table from that presented in Table 3-3, p. 24 in the Chapter 3.

Chapter 6, Stream Channel Form, Lower Missouri River Subbasin.

In the last paragraph, it should be indicated that the projects potentially affecting channel stability are subject to Section 404 regulation and public review under the Clean Water Act. This process offers the potential to reduce or mitigate project impacts to the stream bank and the aquatic community.

Chapter 6, Wetlands, Sheridan County Groundwater Area, p. 143-144.

This section indicates that sprinkler irrigation projects near wetlands could disturb wetlands to the point that a Section 404 permit would be required from the Corps of Engineers. The only way that Section 404 would apply is if wetlands were affected by discharge of fill associated with construction of the well, levelling of the field, or actual operation of the sprinkler system. Section 404 does not apply to dewatering of the wetland related to irrigation withdrawals nor to irrigation runoff entering adjacent wetlands.

Paragraph 7 indicates that farmed or cultivated wetlands have lost their wetland value. This is not a universally valid statement as some years seasonal wetlands will provide waterfowl habitat as long as the basin has food and water. Some wetland species of plants are favored by occasional cultivation as long as they are not stressed by herbicide residues.

Chapter 6, Wetlands, Milk and Little Missouri Subbasins, p. 144-146.

This paragraph indicates possible impacts to wetlands from some of the projects, including construction of dikes and land levelling for water spreading (irrigation). Sponsors of these projects will need to apply for a Section 404 permit, which will evaluate the extent of impact and possible need for mitigation.

Chapter 6, Fisheries and Aquatic Habitat, p. 149, 6th paragraph.

The potential sedimentation impact, as well as other aquatic impacts related to construction adjacent to streams, can be reduced through the public review process associated with the Section 404 permit program. This process enables the consideration and adoption of legally enforceable mitigation measures, including the ones related to construction which are discussed later in the chapter.

Chapter 6, Wildlife, Lower Missouri River Subbasin, p. 159, 2nd paragraph, and Sheridan County Groundwater Area, p. 160, 2nd paragraph.

Filling of wetlands in conjunction with land levelling for irrigation is a regulated activity under Section 10 of the Clean Water Act and will require a permit. This provides the opportunity for reduction of wetland impacts.

APPENDIX A

CORPS UPDATE ON MISSOURI RIVER OPERATIONS

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, MISSOURI RIVER DIVISION
12565 WEST CENTER ROAD
OMAHA NEBRASKA 68144-3869

July 22, 1994

REPLY TO
ATTENTION OF

Division Engineer

Honorable Marc Racicot
Governor of Montana
Helena, Montana 59620

Dear Governor Racicot:

We have completed preparation of the Draft Environmental Impact Statement (DEIS) and supporting technical reports for the Missouri River Master Water Control Manual Review and Update. These documents are now in final editing and reproduction and will soon be released to the public for review and comment.

To assist you in understanding the DEIS documents, we have prepared an Executive Summary which is enclosed. This summary should allow you to become conversant with the major issues involved.

A four-month public comment period will commence upon release of the DEIS. A series of public hearings will be conducted throughout the Missouri River Basin and in Memphis, Tennessee in late September and October. These public hearings will be preceded by workshops to help the public understand the DEIS. The schedule for the public hearings has been coordinated with each state, and a public announcement of the specific hearing sites will be made in August.

Thank you for your continued interest in the management of the Missouri River.

Sincerely,

John E. Schaufelberger

John E. Schaufelberger
Colonel, Corps of Engineers
Division Engineer

Enclosure

Missouri River Master Water Control Manual

Review and Update Study

Draft Environmental Impact Statement

Executive Summary

U.S. Army Corps
of Engineers
Missouri River Division

July 1994

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PURPOSE AND NEED FOR ACTION

The Federal action considered in this environmental impact statement (EIS) is the operation of the Missouri River Mainstem Reservoir System and the downstream Navigation and Bank Stabilization Project (Mainstem System). The Mainstem System is operated under the guidelines of the Master Water Control Manual (Master Manual), which identifies the current Water Control Plan.

In October 1989, the Missouri River Division of the U.S. Army Corps of Engineers (Corps) was directed to initiate a study to search for Master Manual operating criteria that better serve the contemporary uses of the Missouri River system. The study was called the Missouri River Master Water Control Manual Review and Update. The study solicited input from interested parties, identified alternatives to the current Water Control Plan, evaluated impacts of the alternatives, and identified the best plan for operation of the Mainstem System. Included in this study was the preparation of an EIS.

Background

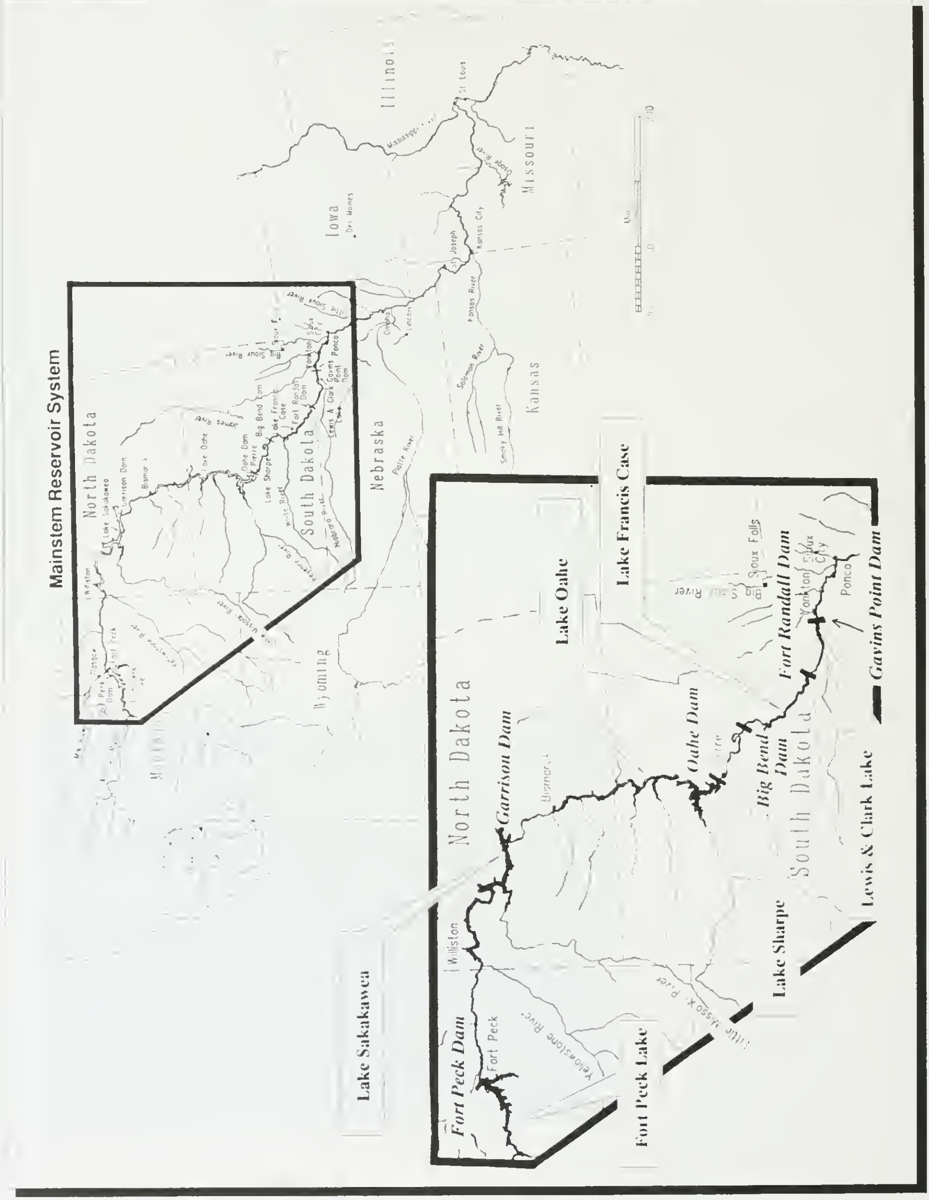
The Mainstem System consists of six dams and lakes constructed, operated, and maintained by the Corps (Figure 1). Water flowing down the Missouri River is stored in the six lakes and released as needed for downstream purposes. Released water flows downstream through the Navigation and Bank Stabilization Project from Sioux City to St. Louis. These Mainstem System projects were originally authorized under various Congressional acts from 1912 to 1945 and later modified in subsequent acts. The Corps operates the Mainstem System to balance the needs of the system's many uses, including flood control, navigation, irrigation, hydropower, water supply, water quality control, recreation, and fish and wildlife.

The Master Manual describes the current Water Control Plan for operating these projects. It was first published in 1960 and later revised in 1973, 1975, and 1979. Because of numerous changes in the Missouri River Basin since earlier versions of

Wetlands bordering river

Figure 1

Project area map.



the Master Manual and the significant effects on all project purposes during the recent drought (1987 to 1992), the Corps began the latest review of the Master Manual in November 1989.

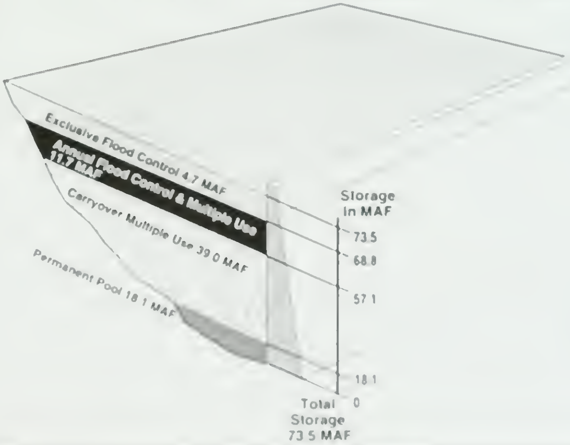
As required by the National Environmental Policy Act (NEPA) and other environmental laws for major Federal actions, the Corps' review of the Master Manual includes technical studies, alternatives development, and economic, environmental, and social impact assessments. As part of the review process, the Corps prepared a draft environmental impact statement (DEIS), and supporting appendices, to evaluate the potential social and environmental effects from proposed changes to system operation.

Current Water Control Plan

The existing Master Manual prescribes operation of the Mainstem System for the multiple project purposes of flood control, hydropower, water supply, water quality, irrigation, navigation, recreation, and fish and wildlife. For planning purposes, the Master Manual separates the total available storage volume in the mainstem lakes into four zones: (1) storing flood waters (the exclusive flood control zone), (2) storing flood waters and water for other uses (the annual flood control and multiple use zone), (3) storing water for multiple uses (the carryover multiple use zone), and (4) retaining water permanently (the permanent pool). Figure 2 shows this division in volumes expressed in millions of acre-feet (MAF) (an acre-foot is equivalent to an acre covered by one foot of water) for the total system. Figure 3 shows the allocation of three parts (the first two for flood control are combined) for each of the lakes.

Figure 2

Mainstem System total storage by zone

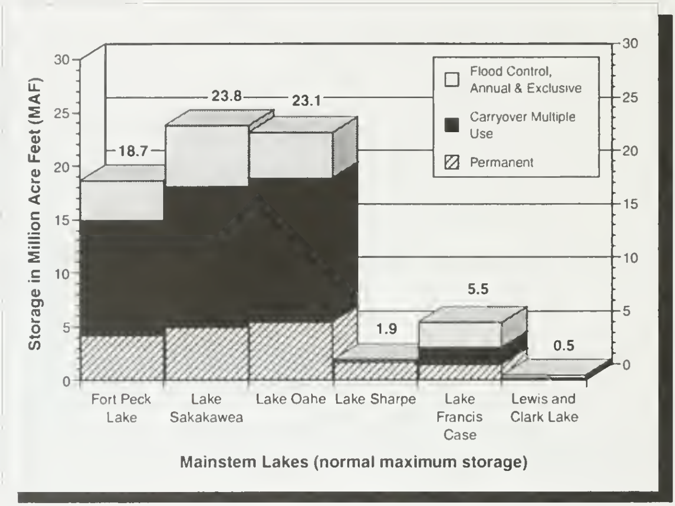

Exclusive Flood Control 4.7 MAF
Annual Flood Control & Multiple Use 11.7 MAF
Carryover Multiple Use 39.0 MAF
Permanent Pool 18.1 MAF
Storage In MAF
73.5
68.8
57.1
18.1
0
Total Storage 73.5 MAF

The exclusive flood control zone is the total upper volume of the mainstem reservoirs maintained exclusively for flood control. Water is released from this zone as quickly as downstream channel conditions permit so that sufficient space remains for capturing future incoming flood waters.

The annual flood control and multiple use zone is used to capture high spring and summer river flows into the lakes. Later in the year, water stored in this zone is released for downstream uses so that the zone is emptied by the beginning of the next flood season on March 1. This zone provides benefits for navigation, water supply, hydropower, water quality control, recreation, and fish and wildlife. As with the exclusive flood control zone, most of the water is released from the lakes during the summer and fall navigation season.

Figure 3

Mainstem System storage allocation for the current Water Control Plan.



The largest zone of storage, the carryover multiple use zone (Figure 3), remains full in most years but is gradually drawn down in multiyear droughts. Release of water from this zone is controlled by demands for navigation and nonnavigation services in the river below Sioux City.

The remaining storage capacity, the permanent pool, is the minimum water level necessary to operate the hydropower plants at the dams. The permanent pool also provides a minimum amount of water necessary for recreation, fish and wildlife, and the water supply for towns and irrigators located around the lakes.

The Master Manual specifies the criteria for releasing water from the four zones. The release criteria relate to the total amount of water stored in the lakes. When the amount of stored water declines during droughts, cutbacks in releases are made to conserve water. The criteria were originally designed so that the water stored would be sufficient to sustain navigation through a drought like that of the 1930s and early 1940s. The current Water Control Plan contains guidelines for reducing navigation service (the depth of water in the navigation channel) and shortening the navigation season during droughts. It also specifies minimum releases to the lower Missouri River during droughts when navigation is suspended.

The Master Manual provides specific rules for water releases from Fort Randall and Gavins Point Dams, and general water release criteria for the other four dams. Internal regulation of the system to meet the needs of power generation follows a seasonal pattern at each of these dams. Demands for water releases for navigation generally set the seasonal intrasystem regulation patterns. In general, the movement of water in storage from one reservoir to another follows a basic pattern each year. Occasionally, short term adjustments in intrasystem regulation are necessary.

Fort Randall Dam and Lake Francis Case

Big Bend Dam and
Lake Sharpe

ALTERNATIVES TO THE CURRENT WATER CONTROL PLAN

The search for a water control plan that better serves the present day needs of the basin has focused on two primary features of the Master Manual

- The amount of water stored in the permanent pool and the carryover multiple use zones of the lakes, and
- The allocation of water in storage for downstream needs (i.e., navigation, water supply, irrigation, power production, water quality, flood control, recreation, and fish and wildlife)

Other features of the operations of the Mainstem System are not being considered for change. The allocation of reservoir storage for flood control was reviewed, but not changed. Structural changes in the reservoir system and navigation channels are not being considered. Also not being considered are temporary system unbalances, daily and weekly release patterns, and other intrasystem, short-term variations. The vast array of intrasystem details and daily operating specifics are appropriately evaluated in the context of the annual operating plan. Tributary projects are also not within the scope of the review.

Alternatives to the current Water Control Plan considered in the DEIS have varying system storage and release criteria. Overall, there are seven features of the Water Control Plan being evaluated for change:

1. Modified navigation service criteria for service level and season length in periods of drought
2. Reduction in navigation season length in nondrought periods
3. Addition of a spring rise in river flow through higher spring service levels
4. Increases in seasonal nonnavigation service levels
5. Reduced flood control constraints on system releases
6. Modified intrasystem regulation of stored water among the upper three lakes
7. Higher permanent pool levels

Modified Navigation Service Criteria

Navigation service criteria for drought periods are a key feature of the Master Manual that is being evaluated. The navigation service level (the amount of river flow required to provide specific depths in the navigation channel) and the navigation season length are major factors that govern the release of water in droughts. Navigation service level and season length are necessarily cut back in droughts to conserve water for upstream and down

The amount of water in system storage required for providing full navigation service under the current Water Control Plan on March 15 is 54.5 MAF. A total of 59.0 MAF on July 1 is also required to continue the full service level to the end of the season. As the stored water declines below these levels, navigation service is reduced towards minimum service until the levels reach 46.0 and 50.5 MAF on March 15 and July 1, respectively. At lower stored water levels, only minimum navigation service is supported by Mainstem System releases. The current and the modified navigation service level criteria are presented in Table 1 for an 18-MAF permanent pool. These values go up slightly for higher permanent pool alternatives. The modification would lower the amount of stored water released in support of navigation in drought periods. A new season length criteria that would reduce the navigation season length as the amount of stored water falls in drought periods is also being considered. Navigation season lengths are currently shortened when total stored water levels drop below 41 MAF on July 1, and the 8-month full season is reduced proportionately as stored water levels decline to 25 MAF on July 1. If the amount of stored water is less than 25 MAF, a 6-month season is supported unless this support would release the amount of water stored during the minimum season to less than 18 MAF (top of the permanent pool). Table 1 also presents current and modified season length criteria for the 18-MAF permanent pool option.

Table 1

Navigation service criteria for current and modified water control plans.

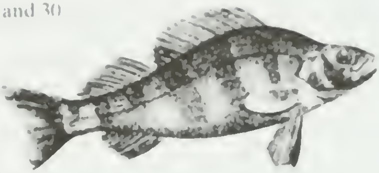
	March 15 (MAF)		July 1 (MAF)	
Service Level	**Current**	**Modified**	**Current**	**Modified**
Reduced Service	<54.5	<57.5	<59.0	<62.5
Minimum Service	<46.0	<54.5	<50.5	<60.5
Season Length			**Current**	**Modified**
Shortened Season			<41.0	<60.0
Minimum Season			<25.0	<52.0

Reduced Navigation Season Length

Reducing the navigation season length from 8 to 7 or 6 months in nondrought years is also being evaluated as a means of conserving stored water. Two forms of the 6-month navigation season are being evaluated. In addition to an April through September shortened season, a split season with two periods of navigation (April to July and October to November) is being evaluated.

Higher Spring Service Levels

Higher spring service levels are also being evaluated to provide a more natural spring rise in river flows to benefit native fish of the river. Additions to the spring navigation full service level of 10, 20, and 30 thousand cubic feet per second (kcfs) are being evaluated.



Increasing Nonnavigation Service Levels

Increasing the minimum flows in the river below the dams during drought periods is also being evaluated in the DEIS. Because navigation service is not always supported in drought periods, releases of stored water are necessary to maintain sufficient river flow to protect water supply and other downstream uses. Increasing the winter nonnavigation service level from the present 12 kcfs to as high as 18 kcfs is being evaluated. Increasing the spring and fall nonnavigation service level from the present 9 kcfs to as high as 25 kcfs is being evaluated. An increase in the summer nonnavigation service level from 9 kcfs to as high as 25 kcfs is being evaluated.

Reduced Flood Control Constraints

Constraints on releases during downstream flooding are also being evaluated. Current constraints provide a cutback in system releases to the normal full navigation service (35 kcfs) or minimum navigation service (29 kcfs) levels whenever flows exceed specified target levels in the lower river from Omaha to Kansas City. Two alternative criteria are being evaluated in the DEIS: (1) cutting system releases to provide only the minimum navigation service level, and (2) not cutting back releases regardless of the severity of downstream flooding. These changes would allow spring flows to remain higher in the river below Gavins Point Dam for the benefit of fish and wildlife while increasing the potential for downstream flooding.

Modified Intrasystem Regulation

The regulation of stored water among the mainstem lakes is also being evaluated in the DEIS. The current method of intrasystem regulation of stored water provides for an annual balanced regulation of storage among the upper three lakes. Although storage among these lakes is unbalanced seasonally, an effort is made to follow a consistent pattern for the balance of stored water among the lakes on an annual basis. An alternative to this scheme was developed that unbalances annual stored water on a scheduled basis among the three lakes to provide more optimal conditions for fish production. At least once in every three years, the level of each lake is allowed to rise in spring to enhance fish production.

Higher Permanent Pool Levels

The final feature of the Master Manual being evaluated for change is allocation of system storage between the permanent pool and carryover multiple use zones. Changes to the amount of storage designated as permanent pool would have an effect on lake levels and water releases from dams during drought periods. An increase in the current permanent pool of 18 MAF would reduce the amount of stored water in the carryover multiple use zone for release during drought periods for downstream needs. Of the total possible range of 0 to 57 MAF for the permanent pool, only the range from 18 to 48 MAF is considered in the DEIS. Levels below 18 MAF are not considered because the hydroelectric generators at the three largest lakes could not be operated effectively at lower levels. Permanent pools above 48 MAF are not considered, because there would be insufficient water in the remaining (less than 9 MAF) carryover multiple use zone to provide adequate water releases for downstream needs in many drought years.

Interior least tern—an endangered species

EFFECTS OF CHANGES ON KEY RESOURCES

Changes in the current Water Control Plan would affect important economic uses (flood control, water supply, hydropower, recreation, and navigation) and environmental resources (water quality, wetland and riparian habitat, wildlife, fish, socioeconomics, and historic properties) in the Missouri River Basin. Effects on key uses and resources are summarized below.

Flood Control

Agricultural lands, residential areas, business districts, and navigation benefit from flood control on the Missouri River. Approximately 1.1 million acres of farmland is subject to flooding along the Mainstem System. There are approximately 22,500 residential and 3,300 nonresidential buildings with an approximate worth of $10.8 billion located within identified flood zones. The navigation industry located below Sioux City is valued at $18 million per year and is subject to losses resulting from interrupted service during floods.

Under the current Water Control Plan, long-term average annual flood control benefits (reductions in flood losses) are estimated at $44 million, while benefits in an extended drought like that of the 1930s and early 1940s would average about $57 million. Changes in the current Water Control Plan would have the following effects on flood control benefits:

- Modified navigation service criteria would reduce benefits by less than 1 percent.
- Shortening the navigation season would reduce benefits by less than 1 percent.
- Higher spring service levels would reduce benefits by 1 to 2 percent for each 10 kcfs rise in service level.
- Higher nonnavigation service levels would increase benefits by no more than 1 percent.
- Reduced flood control constraints would reduce average benefits 10 percent and extended drought benefits 2 percent.
- The modified intrasystem regulation would reduce the benefits by less than 1 percent.
- Higher permanent pool levels would reduce average benefits up to 3 percent and extended drought benefits up to 5 percent.

Water Supply

The Missouri River and its mainstem lakes are a source of water for municipal water supply; irrigation; cooling water; and commercial, industrial, and domestic uses. There are approximately 1,600 water intakes of widely varying size on the Mainstem System. Access to water is a key concern because low water levels increase the cost of getting water from the lakes or river. Twenty-five coal-fired and nuclear powerplants with a combined generating capacity of 15,084 megawatts draw cooling water from the Mainstem System. The flow in the river and the river's water temperature affect a powerplant's ability to operate within discharge permit requirements. Low flows in the river may therefore force cutbacks in power production.

Under the current Water Control Plan, long-term average annual water supply benefits are valued at $546 million, while the average annual benefits in extended droughts like that of the 1930s and early 1940s would be about $550 million. Changes in the current Water Control Plan would have the following effects on water supply benefits:

- The modified navigation criteria, through higher lake levels in droughts, would improve the water supply benefits by less than 1 percent, with slightly more than 1 percent improvement during droughts.
- Shortening the navigation seasons by eliminating support for navigation in August and September in nondrought periods would reduce water supply benefits approximately 2 percent and drought period benefits by 3 percent. Eliminating navigation support in October and November, or November alone, would have little effect on water supply benefits.
- The spring rise in service levels of 10 to 30 kcfs would reduce the water supply benefits by less than 1 percent.
- Higher winter minimum nonnavigation service levels would reduce overall water supply benefits by less than 1 percent in nondrought years and approximately 2 percent during extended droughts because of reduced lake levels. Higher spring/fall and summer nonnavigation service levels would produce little or no reductions to water supply benefits in either nondrought or drought periods.
- Modified intrasystem regulation would have little or no effect on water supply benefits.
- Reduced flood control constraints would have little or no effect on water supply benefits.
- Higher permanent pool levels would reduce long-term water supply benefits by up to 2 percent and extended drought benefits up to 8 percent.

Hydropower

The six mainstem dams support 35 hydropower units with a combined capacity of 2,409 megawatts (MW) of potential power generation. These units provide an average 10 million megawatt-hours (MWh) of energy per year, or approximately 9 percent of the combined energy used in the Mid-continent Area Power Pool (MAPP), which includes Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and portions of Illinois, Montana and Wisconsin. Nearly all the water that flows into the Missouri River passes through these hydroelectric turbines. Energy is lost if releases of lake water are not passed through turbines. The value of the energy produced varies from season to season depending on power demand. Power generation at the six mainstem dams generally must follow the seasonal pattern of water movement through the system, however, adjustments have been made (when possible) to provide maximum power production during summer and winter when demand is high.

Gavins Point Dam

Under the current Water Control Plan, long-term average hydropower benefits are valued at $620 million per year, while average benefits in extended droughts would be about $548 million. Changes in the current Water Control Plan would have the following effects on hydropower benefits:

- The modified navigation service criteria would improve the long-term hydropower benefits by about 1 percent, with a 3 percent improvement in extended droughts.
- Shortening the navigation seasons would have little effect on benefits.
- A spring rise in the service level of 10 to 30 kcfs would reduce hydropower benefits by 1 to 2 percent over the long term and in droughts.
- Higher minimum nonnavigation service levels would reduce hydropower benefits less than 1 percent.
- Modified intrasystem regulation would reduce hydropower benefits less than 1 percent.
- Reducing flood control constraints would reduce hydropower benefits less than 1 percent.
- Higher permanent pool levels would increase long-term hydropower benefits up to 2 percent while extended drought period benefits would increase up to 6 percent.

Recreation

The six large lakes of the Mainstem System and the reaches of the Missouri River between and below the lakes provide considerable recreation opportunities to residents of the States through which the river flows, as well as neighboring States. These opportunities include boating, fishing, hunting, camping, sight-seeing, and swimming. Sport fishing is a major source of recreation along the entire system. The wetlands along the river corridor provide waterfowl habitat, and waterfowl hunting is popular.

Most of the recreation opportunities are in the mainstem lakes. There are over 80,000 acres of recreational lands along the nearly 6,000 miles of lake shoreline. There is an extensive network of roads, boat ramps, and campgrounds, and additional facilities are being developed.

River recreation, like lake recreation, is predominantly water-based, with boating and fishing as major activities. Portions of the river above Fort Peck Lake, below Fort Randall Dam, and below Gavins Point Dam have been designated "National Recreational River Reaches," as a part of the National Wild and Scenic Rivers System.

Water levels are a key factor in recreational use of the lakes and river reaches. At low lake levels, some boat ramps are unusable and recreational areas at the upper ends of the lakes may not provide access to the lakes. Low river flows affect boat access and maneuverability. Certain kinds of fishing and hunting depend upon adequate lake levels and river flow. Visitors are also less likely to frequent lakes and river reaches at low water for aesthetic reasons. In the recent drought (1987 to 1992), there was reduced access and many recreational areas were closed. Many boat ramps had to be extended and facilities had to be improved at open recreation sites to minimize overcrowding. Overall, the quality of recreation on the Mainstem System suffered.

Under the current Water Control Plan, long-term average recreation benefits are valued at $76 million, while benefits during extended droughts would average about $60 million. Changes in the current Water Control Plan would have the following effects on recreation benefits:

- The modified navigation service criteria, through higher lake levels in droughts, would improve long-term average recreation benefits by 4 percent, with a 14 percent average increase in extended droughts. Lake recreation would benefit the most because the upper three mainstem lakes would be drawn down less during droughts, while river recreation would be relatively unaffected because spring through fall river flows would not be affected.
- Eliminating support for navigation in late summer would reduce the long-term average benefits by 2 percent and the extended drought benefits by 7 percent. Eliminating navigation support in the fall would have little effect on benefits.
- The spring rise in service level of 10 to 30 kcfs would reduce long-term average recreation benefits a maximum of 1 percent by decreasing spring and summer lake levels in non-drought years.
- Higher winter minimum nonnavigation service levels would reduce long-term average benefits about 1 percent, while drought period benefits would decline about 8 percent because of reduced lake levels. Higher spring/fall and summer nonnavigation service levels would have minimal overall effect because they are less frequently activated in droughts.
- Modified intrasystem regulation would have minimal overall effect on recreation benefits, but would measurably improve drought period benefits in the upper mainstem lakes by allowing increased spring and summer lake levels in some years and provide for greater fishing opportunities.
- Reduced flood control constraints would have little or no effect on recreation value.

- Higher permanent pool levels would reduce the effects of drought on recreation by limiting the decline in lake levels in extended droughts. With an increase in permanent pool from 18 MAF to 48 MAF, long-term average recreation benefits would improve by up to 4 percent, while average extended drought benefits would improve by up to 18 percent.

Navigation

Navigation on the Missouri River occurs from Sioux City to the mouth at St. Louis. In normal years, total commodity tonnage barged on the river averages 2.5 million tons. Approximately 140 docks and terminals operate on the river. The Missouri River Navigation and Bank Stabilization Project provides a 9-foot-deep, 300-foot-wide navigation channel at full navigation service. Navigation service is provided by the release of stored water to maintain a 7.5- to 8.5-foot navigation draft (minimum and full service, respectively) in the navigation channel depending on the amount of water stored in the mainstem lakes. Navigation is limited to the normal ice-free season, with a full-length season of 8 months that generally extends from April 1 to December 1 near St. Louis. With above-normal stored water in the system, the season may be extended 10 days. The amount of stored water in the mainstem lakes needed to support navigation during the season varies depending on the amount of inflow from tributary rivers. In drought years service is reduced (less than 8.5 feet of draft is provided) or even eliminated in some months or years according to the navigation service criteria in the current Water Control Plan. In flood years such as 1993, service may be reduced or eliminated at the upper end of the navigation reach near Sioux City to limit downstream flooding.

Under the current Water Control Plan, long-term navigation benefits would average approximately $18 million per year, while benefits would average $12 million in an extended drought. Changes in the current Water Control Plan would have the following effects on navigation benefits:

- The modified navigation criteria would reduce average long-term and extended drought benefits by about 5 percent.
- Elimination of August and September navigation support would reduce long-term benefits about 20 percent and extended drought benefits by 37 percent. Eliminating October and November support would reduce long-term benefits by 13 percent and extended drought benefits by 10 percent. Reducing support only one month (November) would reduce the benefit 5 to 10 percent.
- The spring rise in service level of 10 to 30 kcfs would reduce navigation benefits from 1 to 2 percent for each 10-kcfs increase in service level.
- Higher winter nonnavigation service levels would decrease long-term average navigation benefits up to 6 percent, with an average reduction of

up to 30 percent in extended droughts. Higher fall nonnavigation service levels would decrease long term benefits up to 4 percent and extended drought benefits up to 35 percent. Higher spring and summer nonnavigation service levels would have little or no effect because navigation service would be provided in most drought years.

- Eliminating flood control constraints would reduce long term navigation benefits up to 3 percent, because extra releases of stored water would not benefit navigation and less stored water would reduce subsequent navigation service.
- Modified intrasystem regulation would have no effect on navigation benefits because releases to the navigation reach would be minimally affected.
- Higher permanent pool levels would lead to reduced service, shortened seasons, and fewer navigation years in extended drought periods. Long term benefits would be reduced up to 10 percent, while extended drought benefits would be reduced up to 40 percent.

Navigation—barge on the river

Water Quality

Water quality in the Mainstem System is generally good with only minor suspected problems. In the upper lakes, summer oxygen levels in the deeper colder waters are a potential problem, especially in droughts when the volume of the deeper coldwater layer is reduced. Water temperature is a consideration in the river reaches, particularly in the lower river where the discharge of water used for cooling by many powerplants is controlled under discharge permits. Lower river flows provide less dilution for the warmwater discharges from the powerplants, and thus lead to higher river water temperatures. In extreme cases water temperature increases would be limited by cutbacks in power production to meet discharge permit requirements.

Changes in the current Water Control Plan would affect water quality in the following ways:

- The modified navigation service criteria would improve dissolved oxygen levels in summer in the upper mainstem lakes during droughts by providing higher water levels. Reduced navigation service in drought periods would lower river flows and increase water temperature considerations in the lower river.
- Shortening the navigation season by eliminating late summer or fall navigation support would improve water quality in the upper lakes, particularly in droughts. A shortened navigation season and its associated lower river flows, particularly during droughts, is a consideration in the lower river only in the summer when water temperature is highest.
- Higher spring navigation service levels would have little effect on water quality because they would not affect water levels or river flows appreciably in drought periods.
- Higher nonnavigation service levels would improve water quality in drought periods in the lower river, but aggravate dissolved oxygen problems in the upper lakes by further lowering lake levels in droughts.
- Reduced flood control constraints would have little effect on water quality because changes in lake levels and river flows would be confined primarily to nondrought periods.
- Modified intrasystem regulation would improve water quality in the upper lakes by increasing upper mainstem lake levels in at least one of three years in droughts, but would have minimal effect on the lower river.
- A higher permanent pool level would improve water quality in the upper lakes by increasing lake levels in droughts; however, lower river water temperature considerations would increase in droughts because of reduced navigation service.

Wetland and Riparian Habitat

The floodplain of the Mainstem System has approximately 113,000 acres of wetlands, 60,000 acres of exposed shoreline, and 913,000 acres of riparian vegetation. The deltas of the mainstem lakes support varying amounts of wetlands depending on lake level. Near the end of the 1991 drought, there were 59,000 acres of wetlands in the deltas of the mainstem lakes. After the floods in 1993 and a return to near normal lake levels, most of the wetlands in the upper three lakes were flooded and new wetlands began forming at higher elevations in the deltas. The floods also changed the character of the wetland and riparian vegetation in the lower river. Mature woody riparian habitat in the river reaches between the mainstem lakes is limited because cottonwoods have not regenerated under the controlled flow regimes. In the lower river, wetland and riparian habitats are limited by channelization and bank stabilization. Wetlands are concentrated in remaining oxbows (isolated bends in the river) and backwaters. The lower channelized portion of the river supports much lower densities of wetland and exposed shoreline habitat than the upper unchannelized portions near the mainstem lakes.

Under the current Water Control Plan, long-term wetland habitat would average approximately 155,000 acres per year, while in extended droughts the average would be approximately 144,000 acres. Riparian habitat would average 108,000 acres over the long term and 122,000 acres in extended droughts. Changes to the current Water Control Plan would have the following effects on wetland and riparian habitat:

- The modified navigation service criteria would increase long-term mean annual wetland habitat less than 1 percent and decrease riparian habitat about 2 percent.
- Shortening the navigation season by eliminating support in August and September would increase long-term and extended drought wetland habitat by about 2 percent and decrease riparian habitat about 3 percent. Shortening the season in October and November, or only in November, would increase wetland habitat less than 1 percent and decrease riparian habitat about 3 to 4 percent.
- A spring rise in service levels of 10 to 30 kcfs would increase average long-term wetland habitat up to 7 percent and extended drought habitat by up to 5 percent. Riparian habitat would be reduced up to 8 percent over the long term and up to 6 percent in extended droughts.
- Higher nonnavigation service levels would have a minimal effect on wetland and riparian habitat.
- Reduced flood control constraints would increase long-term average wetland habitat up to 1 percent and average extended drought habitat by up to 2 percent. Riparian habitat would decline by up to 2 percent over the long term and in extended droughts.

Island nesting habitat for terns and plovers

- Modified intrasystem regulation would reduce wetland habitat by up to 1 percent and reduce riparian habitat up to 3 percent.
- Higher permanent pools would increase long-term average wetland habitat up to 2 percent and average extended drought wetland habitat up to 6 percent. Riparian habitat would decline up to 3 percent over the long term and up to 6 percent in extended droughts.

Wildlife

The Missouri River supports important forest and wetland habitat for a wide variety of wildlife including at least 60 species of mammals, 301 species of birds, and 52 species of reptiles or amphibians. Of these, 6 birds and 2 bat species are listed as threatened and endangered under the Endangered Species Act. The combination of open water, wetlands, and riparian habitat is particularly important for the large number of waterfowl that stop along the river during the spring and fall. Of the threatened and endangered bird species, of particular importance are the endangered interior least tern and threatened piping plover because they depend on the river for nesting and are directly affected by water level changes. These birds typically nest in colonies on river sandbars, sandy shorelines of lakes, or in sandpits along the river. Important nesting reaches are below Fort Peck, Garrison, Fort Randall, and Gavins Point Dams.

River hydrology and channel characteristics influence the composition and distribution of wildlife habitat along the river. Seasonal river flow and water level patterns dictate the frequency and duration of habitat flooding. Bank erosion and sediment movement in the riverbed also play an important part in creating and destroying sandbar and island habitat and scouring sandbar vegetation.

Under the current Water Control Plan, the long-term average amount of tern and plover nesting habitat along the Missouri River is 432 acres, while the average in an extended drought would be about 390 acres. Changes to the current Water Control Plan would have the following effects on tern and plover habitat:

- Modified navigation service would reduce the long-term average habitat by approximately 11 percent and the extended drought average by 16 percent. The effects would be concentrated in the Garrison reach.
- Shortening the navigation season by eliminating navigation support in August and September would increase long-term habitat by about

4 percent, but would reduce extended drought habitat by 7 percent. Eliminating navigation support in October and November would reduce long-long term habitat about 5 percent, while not affecting the amount of habitat during an extended drought.

- A spring rise in service level of 10 to 30 kcfs would increase the long-term average habitat by up to 11 percent, and the extended drought average up to 30 percent.
- Higher nonnavigation service levels would have minimal effect on nesting habitat.
- Reductions in flood control constraints would reduce nesting habitat by 1 to 3 percent.
- Modified intrasystem regulation would improve the long term average nesting habitat by 25 percent and the extended drought average by 44 percent. The improvement would occur in drought and nondrought years and would be concentrated in the reaches below Fort Peck and Garrison Dams.
- Higher permanent pool levels would reduce long-term average habitat up to 6 percent, but increase the extended drought average up to 30 percent.

Fish

Currently, 156 fish species are known to occur in the Missouri River and mainstem lakes. These include native species and many that have been introduced over the years. In the river reaches, the most important sportfish are walleye, sauger, white bass, yellow perch, channel catfish, paddlefish, shovelnose sturgeon, and northern pike. Rainbow and brown trout, chinook salmon, and smallmouth bass are locally abundant in cold tailwaters of the upper three dams. Past commercial fisheries targeted channel catfish, bigmouth buffalo, smallmouth buffalo, flathead catfish, goldeye, and suckers. The native river fishes, including the catfish, sturgeon, sauger, suckers, and paddlefish, have declined because of migration obstruction, loss of habitat, change in habitat, and competition from new species. The pallid sturgeon is listed as an endangered species. Other rare native fish such as the paddlefish, blue sucker, sturgeon chub, and sicklefin chub are being considered for listing under the Endangered Species Act.

The six mainstem lakes of the Missouri River contain a diverse community of coldwater, coolwater, and warmwater fishes. The upper three lakes have been stocked with coldwater game and forage species to take advantage of the coldwater retained through the summer and fall in the deeper waters of the lakes. Chinook salmon, rainbow and brown trout, and rainbow smelt have been stocked in the three lakes. Lake trout have been stocked in Fort Peck Lake along with lake cisco for forage, and both are reproducing naturally. Fish in the lower three lakes and the warmer waters of the upper three lakes include native and non-native species that have adapted to the lake habitat. These include walleye, sauger, smallmouth and largemouth bass, goldeye, carp, channel catfish, shovelnose sturgeon, river carpsucker, white and black crappie, gizzard shad, and many forage species such as emerald shiner. Coldwater fish are raised in hatcheries and stocked in the lakes. The only exception is lake trout in Fort Peck Lake, which in addition to stocking are supported by some natural reproduction in deeper waters along the face of the dam. Most of the warmwater and coolwater species spawn in lake shallows or in tributary streams. Because appropriate natural spawning and rearing habitat is limited, especially in low-water years, some warmwater and coolwater fish such as walleye are stocked.

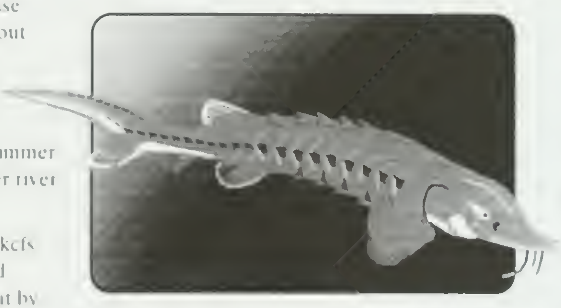
The success of the fish in the Mainstem System depends on habitat conditions. Water levels, inflow, and outflow are important factors in the lakes. In the upper three lakes, low water levels in droughts limit coldwater fish habitat and shallow spawning and rearing habitat of warmwater and coolwater species. In the lower three lakes, high inflow and outflow reduce lake productivity and cause young fish to be flushed from the lakes. Native fish in the river reaches are naturally adapted to the high, warm, and muddy spring and early summer flows, and lower late summer and fall flows characteristic of the historic Missouri River. Cold, clear tailwaters of the upper three dams are more conducive to trout and salmon, but not the native paddlefish, sturgeon, and other fishes.

Coldwater lake habitat under the current Water Control Plan would average about 10 MAF over the long term and 5 MAF in extended droughts. Changes in the current Water Control Plan would have the following effects on coldwater lake habitat:

- Modified navigation service criteria, through higher drought lake levels, would increase long-term average coldwater habitat about 10 percent, and extended drought average habitat about 20 percent.
- Shortening the navigation seasons by eliminating navigation support in late summer would increase long-term coldwater lake habitat by 10 percent and extended drought habitat by 17 percent. Shortening the navigation season by eliminating support in October and November, or November, would have minimal effect on coldwater lake habitat.
- A spring rise in service level of 10 to 30 kcfs would reduce the average long-term and extended drought coldwater lake habitat by up to 8 percent.
- Higher winter nonnavigation service levels would decrease coldwater lake habitat by 3 percent over the long term and 2 percent in extended droughts. Higher spring/fall nonnavigation service levels would reduce coldwater lake habitat by 2 percent over the long term and 3 percent in extended droughts.

- Reductions in flood control constraints would reduce coldwater lake habitat by up to 3 percent on average over the long term and 5 percent in extended droughts.
- Modified intrasystem regulation would improve the long-term average coldwater lake habitat by 2 percent, but have a minimal effect in extended droughts.
- Higher permanent pool levels would increase long-term average habitat up to 15 percent, and increase the extended drought average up to 82 percent.

Coldwater river habitat below the upper two lakes under the current Water Control Plan would cover approximately 187 miles over the long term and 161 miles in extended droughts. Changes in the current Water Control Plan would have the following effects on coldwater river habitat:



- Modified navigation service criteria, through higher drought lake levels, would increase long-term average coldwater habitat about 4 percent and extended drought average habitat about 7 percent.
- Shortening the navigation seasons by eliminating navigation support in late summer or fall would have no effect on coldwater river habitat.
- A spring rise in service level of 10 to 30 kcfs would reduce the average long-term and extended drought coldwater river habitat by up to 3 percent.
- Higher winter nonnavigation service levels would decrease coldwater river habitat by 1 percent over the long term and 2 percent in extended droughts. Higher spring/fall nonnavigation service levels would reduce coldwater river habitat by less than 1 percent over the long term and 3 percent in extended droughts.
- Reductions in flood control constraints would reduce coldwater river habitat by up to 1 percent over the long term and in extended droughts.
- Modified intrasystem regulation would reduce the long term average coldwater river habitat by 3 percent, and by 4 percent in extended droughts.
- Higher permanent pool levels would increase long term average habitat up to 5 percent, and increase the extended drought average up to 15 percent.

Warmwater river habitat below Fort Peck, Garrison, and Fort Randall Dams under the current Water Control Plan would cover approximately 49 miles over the long term and 68 miles in extended droughts. Changes in the current Water Control Plan would have the following effects on warmwater river habitat:

- Modified navigation service criteria, through higher drought lake levels, would decrease long-term and extended drought average warmwater habitat about 4 percent.
- Shortening the navigation seasons by eliminating navigation support in late summer would reduce warmwater river habitat by 3 percent over the long term and 14 percent in extended droughts. Elimination of navigation support in fall would reduce warmwater river habitat about 1 percent or less.
- A spring rise in service level of 10 to 30 kcfs would increase the average long-term warmwater river habitat by up to 13 percent and extended drought habitat by up to 8 percent.
- Higher winter nonnavigation service levels would increase warmwater river habitat by 3 percent over the long term and 4 percent in extended droughts. Higher spring/fall nonnavigation service levels would increase warmwater river habitat by 2 to 3 percent over the long term and in extended droughts.
- Reductions in flood control constraints would reduce warmwater river habitat by up to 1 percent over the long term and up to 3 percent in extended droughts.
- Modified intrasystem regulation would increase the long-term average warmwater river habitat by 3 percent, and by 4 percent in extended droughts.
- Higher permanent pool levels would decrease long-term average warmwater habitat up to 12 percent, and decrease the extended drought average up to 28 percent.

The index of young fish production in the mainstem lakes under the current Water Control Plan would average about 1.96 units over the long term and 1.66 units in extended droughts. Young fish production is expressed as an index derived from survey catch statistics. Changes in the current Water Control Plan would have the following effects on young fish production:

- Modified navigation service criteria, through higher drought lake levels, would increase long-term average young fish production about 1 percent and reduce extended drought average production about 4 percent.
- Shortening the navigation seasons by eliminating navigation support in late summer would increase long-term young fish production by 1 percent and increase production in extended drought habitat by 9 percent.

Shortening the season by eliminating support in the fall would have minimal effect on young fish production.

- A spring rise in service level of 10 to 30 kcfs would reduce the average long-term and extended drought young fish production by up to 1 percent.
- Higher winter nonnavigation service levels would not change young fish production over the long term, but would increase it by 5 percent in extended droughts. Higher spring/fall and summer nonnavigation service levels would not affect young fish production.
- Reductions in flood control constraints would reduce young fish production by up to 3 percent over the long term and 2 percent in extended droughts.
- Modified intrasystem regulation would improve the long-term average young fish production by 2 percent, and 6 percent in extended droughts.
- Higher permanent pool levels would increase long-term average young fish production up to 10 percent and increase the extended drought average up to 38 percent.

Physical habitat for native river fish below Fort Peck, Garrison, Fort Randall, and Gavins Point Dams under the current Water Control Plan would average 59.0 index units over the long term and 60.6 units in extended droughts. Changes in the current Water Control Plan would have the following effects on physical river habitat.

- Modified navigation service criteria would increase long-term and extended drought average physical habitat about 1 to 2 percent.
- Shortening navigation seasons by eliminating navigation support in late summer would increase physical river habitat by 2 to 3 percent over the long term and in extended droughts. Elimination of navigation support in fall would increase physical river habitat about 1 to 2 percent.
- A spring rise in service level of 10 to 30 kcfs would increase the average long-term and extended drought physical river habitat by up to 2 to 3 percent.
- Higher winter nonnavigation service levels would increase physical river habitat by less than 1 percent over the long term and in extended droughts. Higher spring/fall nonnavigation service levels would increase physical river habitat by 1 percent over the long term and 3 percent in extended droughts.
- Reductions in flood control constraints would increase physical river habitat by up to 1 to 2 percent over the long term and in extended droughts.
- Modified intrasystem regulation would increase average physical river habitat by less than 1 percent.

- Higher permanent pool levels would decrease long-term average physical habitat up to 1 percent, and decrease the extended drought average up to 3 percent.

Historic Properties

Historic properties include historic and prehistoric archaeological sites, historic architectural and engineering features and structures, and resources of traditional cultural or heritage significance to Native Americans and other social or cultural groups. Paleontological resources include fossils of prehistoric plants and animals. Significant paleontological resources are found in the Fort Peck region. A variety of archeological sites, including historic forts and homesteads, are found within the lakes, along their shorelines, along the river reaches, and adjacent uplands. Archaeological surveys have discovered nearly 3,000 sites along the Mainstem System. Shoreline and bluff erosion is a constant threat to many of these sites. Some sites within the lakes are threatened by exposure during low water periods.

Changes to the current Water Control Plan would have the following effects on historic properties:

- Modified navigation service criteria would increase effects on historic properties by 7 percent.
- Shortening the navigation season would increase effects on historic properties by less than 1 one percent.
- Higher spring service levels would decrease effects by about 2 percent for each 10 kcfs rise in service level.
- Higher winter nonnavigation service levels would decrease effects by 2 percent.
- Reduced flood control constraints would not change effects on historic properties.
- The modified intrasystem regulation would reduce effects by less than 1 percent.
- Higher permanent pool levels would increase effects up to 14 percent.

Socioeconomic Resources

Seven States—Montana, North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri—border on the Missouri River Mainstem System and benefit directly from the presence of the river and lakes. Benefits are derived from employment and income generated from recreation, hydropower production, transportation of goods, and water supply for powerplants, domestic use, and crop irrigation. Population and economic growth in these States have remained stable. Counties adjacent to the river and lakes account for 32 percent of the population and 27 percent of the economic growth in the States along the Mainstem System portion of the Missouri River. There are 13 Indian reservations along the Mainstem System.

- Fort Peck Indian Reservation (Montana)
- Fort Bertold Indian Reservation (North Dakota)
- Standing Rock Indian Reservation (North and South Dakota)
- Cheyenne River Indian Reservation (South Dakota)
- Lower Brule Indian Reservation (South Dakota)
- Crow Creek Indian Reservation (South Dakota)
- Yankton Indian Reservation (South Dakota)
- Santee Indian Reservation (Nebraska)
- Winnebago Indian Reservation (Nebraska)
- Omaha Indian Reservation (Nebraska)
- Iowa Indian Reservation (Nebraska and Kansas)
- Sac Indian Reservation (Nebraska and Kansas)
- Fox Indian Reservation (Nebraska and Kansas)

Changes to the current Water Control Plan would have the following socioeconomic effects:

- The combination of modified navigation service criteria and modified intrasystem regulation would increase long-term average employment in the counties adjacent and near the Mainstem System approximately 1 to 2 percent, while increasing long-term average total income about 1 percent. The improvement would be higher at 2 to 3 percent for employment and income in the upper portion of the system from Fort Peck Lake downstream to Lake Oahe. Benefits would decline to about 1 percent between Lake Oahe to Lewis and Clark Lake. From Lewis and Clark Lake downstream to Kansas City benefit improvements would be between 0.5 to 1.0 percent. Downstream of Kansas City to St. Louis there would be little or no change in benefits from the modified navigation service criteria and intrasystem regulation.
- The combination of a spring rise in service level by 20 kcfs and elimination of navigation support in the fall would reduce employment opportunities and total income in the counties adjacent and near the Mainstem System about 1 percent. The loss would be less than 1 percent in each of

the various reaches of the upper portion of the system between Fort Peck Lake and Gavins Point Dam. Below Gavins Point Dam the loss would be about 1 percent to Kansas City. From Kansas City to St. Louis the loss in employment and total income would approach 2 percent.

- An increase in the permanent pool level from 18 MAF to 48 MAF would increase long-term average employment and total income in the region about 1 percent. The increase would be 2 to 3 percent in the area of the upper three lakes, 1 to 2 percent in the area of the lower three lakes, 0.5 to 1.0 percent from Gavins Point Dam to Kansas City, and near zero below Kansas City to St. Louis. An increase to the intermediate level of 31 MAF would derive benefits about one-third to one-half the benefits of the 48 MAF level.
- Effects on employment and income from reductions in flood control constraints and increases in the nonnavigation service levels in winter, spring/fall, and summer are unknown but believed to be minimal (less than 1 percent change) based on the relative difference caused by the other factors and relative effects on water levels in the lakes and flows in the river.

SELECTION OF THE PREFERRED ALTERNATIVE

The selection of the preferred alternative involved varying the water control plan criteria and comparing the effects to the environmental resources and economic uses. Wetland habitat, tern and plover habitat, and physical habitat for native river fish were considered primary environmental resources for the selection process. This decision was based on information regarding the biological significance of the various environmental resource categories provided by the U.S. Fish and Wildlife Service during formal consultation under Section 7 of the Endangered Species Act.

Navigation Service Criteria

The navigation service criteria prescribe the navigation service level and the season length in drought periods. Two criteria were compared—the current criteria and a more conservative modified criteria. The modified navigation service criteria results in reduced releases from mainstem lakes at higher total storage levels which in turn reduces navigation service earlier in droughts. Figures 4 and 5 show the effects of changing the navigation service

Figure 4

Changes in economic use and environmental resource values resulting from a change from the current to the modified navigation service criteria. Based on simulations for the period 1898 to 1993.

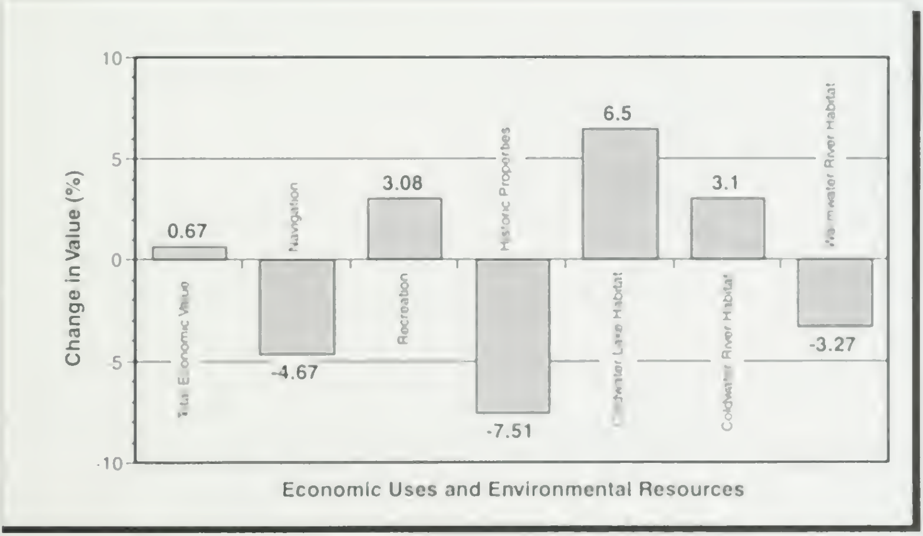
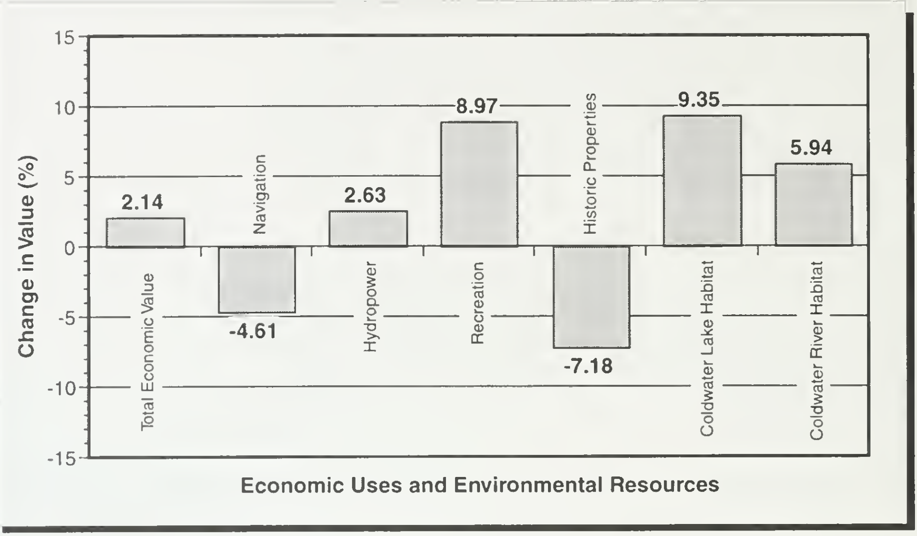


Figure 5

Changes in economic use and environmental resource values resulting from a change from the current to the modified navigation service criteria. Based on simulations for the period 1930 to 1950.



criteria over the 96-year period of record and the 21-year drought period, respectively. The modified navigation service criteria were selected because total National Economic Development (NED) value would increase, as shown on Figure 4, particularly during drought periods, as shown on Figure 5, without affecting primary environmental resources.

Normal Navigation Season

Currently, the normal navigation season is 8 months long— from April 1 to December 1 at the mouth of the Missouri River near St. Louis. When there is excess water in storage at the end of the season, a 10-day extension is provided. Four normal season lengths were considered as shown below.

8-Month Season — April 1 through December 1

7-Month Season — April 1 through November 1

6-Month Season — April 1 through October 1

6-Month Season — April 1 through August 1 and
October 1 through December 1

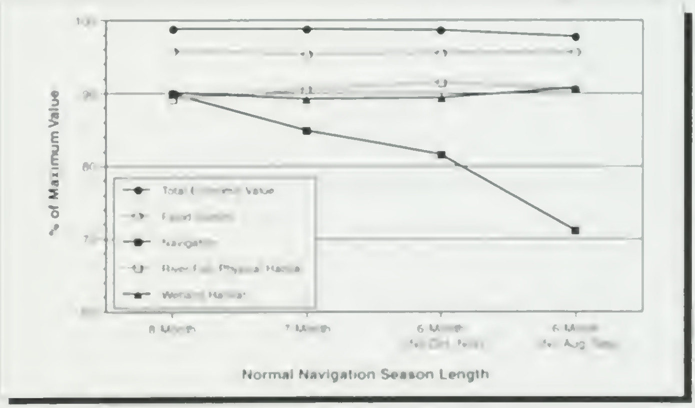
Figure 6 shows the effects of these alternative normal season lengths. The U.S. Fish and Wildlife Service recommended adopting the 6-month split navigation season with no navigation support in August and September. A 7-month navigation season was selected as best representing a balance between navigation, flood control, physical habitat for native river fish, and wetland habitat.

Spring Rise in River Flow

Fishery resource experts have stated that the decline in some of the native river fish species has been influenced by the controlled flows being very different from the "natural" annual flow pattern of high flows in the spring and early summer and lower flows the remainder of the year. The U.S. Fish and Wildlife Service advised that "some semblance of a natural hydrograph is key to the restoration of the river ecosystem." An effort was made to develop alternatives that resulted in a more "natural" flow pattern. This flow pattern would be accomplished by increasing the releases above that needed to meet normal navigation targets during the first 3 months (April to June) of full-service navigation seasons. When releases from the reservoirs are reduced during droughts, corresponding reductions would be made to the size of the spring rise with no spring rise provided when navigation service is

Figure 6

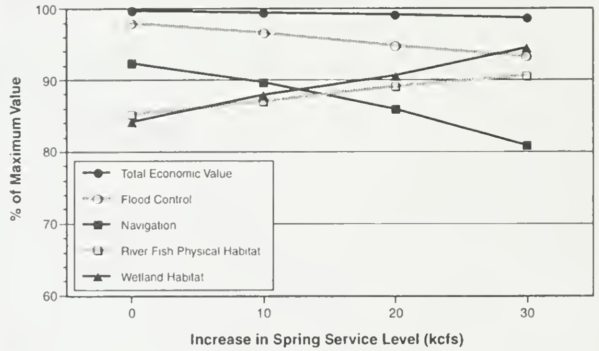
Average annual percent of maximum economic use and environmental resource value for four navigation season options. Based on simulations for the period 1898 to 1993



at the minimum level. July service level would be based on the modified July 1 service level criteria; the remaining navigation season would be at the minimum navigation service level. Three spring rise options were considered: adding 10, 20, and 30 kcfs to the normal full-service levels. Figure 7 shows the effects, as a percent of maximum attainable, of changing the amount of the spring rise. Increasing the spring rise would cause an increase in physical habitat for native river fish and wetland habitat, and a loss in flood control, navigation, and total NED value. A balance in percent of maximum attainable value between the two primary environmental resources and navigation would occur with a spring rise of slightly more than 10 kcfs, and a balance between the two primary environmental resources and flood control would occur at about 30 kcfs. Therefore, a spring rise of 20 kcfs (about halfway between) was selected.

Figure 7

Average annual percent of maximum economic use and environmental resource value for increases in spring service level. Based on simulations for the period 1898 to 1993.



Nonnavigation Service Level

Flows downstream from Gavins Point Dam during periods of nonnavigation are established by the nonnavigation service levels. Target flow levels at Sioux City, Omaha, and Kansas City for three seasons—winter, spring/fall, and summer—were evaluated. Minimum winter nonnavigation service levels of 9, 12, 15, and 18 kcfs were evaluated. The winter season extends from December through February. A minimum winter service level of 12 kcfs was selected because total NED value would decline by decreasing to 9 kcfs and not improve by increasing the service level to 15 or 18 kcfs. The spring season includes March and April. Fall includes September, October, and November. Nonnavigation service levels of 9, 12, 15, 18, and 25 kcfs were considered for the spring/fall seasons. Actual operating experience and previous economic studies found that flows lower than 9 kcfs significantly increases water supply costs. The 9-kcfs level was selected for the minimum spring/fall nonnavigation service level because it provides the best overall balance among economic and environmental resource values. Summer season includes May, June, July, and August. Service levels of 9, 12, 15, 18, and 25 kcfs were considered. A summer nonnavigation service level of 9 kcfs was selected because total economic value did not significantly improve with increased service level while wetland and tern and plover habitat declined.

Flood Control Constraints

Under the current Water Control Plan, when river flows are predicted to exceed established flows at Omaha, Nebraska City, or Kansas City by specified amounts, releases from Gavins Point Dam are reduced. The current plan calls for two levels of reductions which are termed the "full service" and "minimum service" constraints. Three options were considered:

- No flood control constraints
- Minimum service constraint only
- Retain both the full and minimum service flood control constraints

None of the resources would increase significantly as a result of reducing the number of flood control constraints; therefore, it was decided to retain both constraints.

Intrasystem Regulation

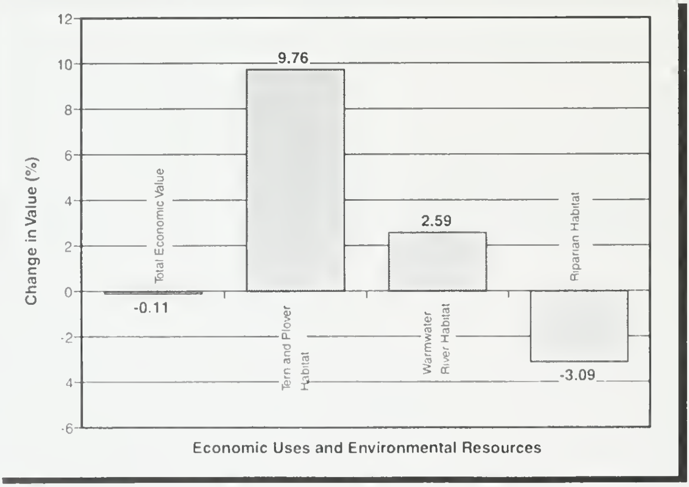
Intrasystem regulation refers to the movement of stored water among the upper three lakes (Fort Peck Lake, Lake Sakakawea, and Lake Oahe). Two options for intrasystem regulation were evaluated: (1) the current method of maintaining a relative balance in the amount of stored water in these reservoirs, and (2) a modified method with a 3-year cycle of purposely causing rising pools in each of these three reservoirs. This would provide a rising pool during fish spawning season at each reservoir at least 1 out of every 3 years. Figure 8 shows the significant effects of changing to the modified intrasystem regulation. Modified intrasystem regulation was selected because of the increase in the tern and plover and warmwater river fish habitat.

Permanent Pool

The current Water Control Plan reserves 18 MAF in the combined permanent pools of the six mainstem lakes as the lowest level to which water will be withdrawn. Permanent pools of 18, 26, 31, 38, and 44 MAF were considered. An 18-MAF permanent pool was selected based on slight economic loss and a decline of physical habitat for native river fish at higher permanent pools.

Figure 8

Changes in total economic use and resource values resulting from a change from the current to the modified intrasystem regulation. Based on simulations for the period 1898 to 1993.



Summary of Preferred Alternative

Table 2 lists the nine water control plan criteria being reviewed for the current Water Control Plan and the preferred alternative. Of the nine variables, five remained unchanged after review:

- winter nonnavigation service level
- spring/fall nonnavigation service level
- summer nonnavigation service level
- flood control constraints
- permanent pool level

Four variables were changed:

- navigation service criteria
- intrasystem regulation
- normal navigation season length
- spring service level

Table 2

Comparison of criteria for the current Water Control Plan and preferred alternative

Water Control Plan Criteria	Current Water Control Plan	Preferred Alternative
Navigation Service Criteria	Current	Modified
Intrasystem Regulation	Current	Modified
Nonnavigation Service Level		
Winter	12 kcfs	12 kcfs
Spring/Fall	9 kcfs	9 kcfs
Summer	9 kcfs	9 kcfs
Flood Control Constraints	2 Constraints	2 Constraints
Normal Navigation Season	8 Months	7 Months
Spring Rise in Service Level	Navigation Target	Navigation Target + 20 kcfs
Permanent Pool	18 MAF	18 MAF

EFFECTS OF THE PREFERRED ALTERNATIVE

The impacts of the current Water Control Plan and the preferred alternative on environmental resources and economic uses were compared to portray the consequences of adopting the preferred alternative. Average annual values for the 96-year simulation period for both water control plans are shown in Table 3. The impacts identified in this table are discussed in the remainder of this section.

Total Water in Storage and River Flow

The total amount of water in Mainstem System storage is affected by two components of the preferred alternative. In non-drought periods, the total amount of water in storage would be drawn down earlier by the higher spring flow requirements from mid-March through mid-June. Reduced releases of water in storage over the remainder of the navigation season would recover some of the water in storage. In drought periods, releases of stored water are curtailed earlier, which reduces the drawdown of the mainstem lakes in these water-short periods. Both the navigation service level and season length are reduced earlier in the drought periods. If the drought is severe enough, releases and the associated declines in stored water are similar for both water control plans because both are providing a minimum navigation service level with a 6-month season length. Figure 9 shows a comparison of water in mainstem storage for both water control plans during the recent drought.

The amount of stored water in each of the upper three reservoirs does not follow the general overall pattern of the total amount of stored water. Modified intrasystem regulation under the preferred alternative causes a 3-year cycle of declining and rising pools at these three reservoirs. For example, Fort Peck Lake can decline in a high inflow year because it is supplying the water needed for a rising pool at either of the two downstream reservoirs, which have releases that are meeting potential high flow needs in the lower river.

Intrasystem reservoir releases and river flows are impacted primarily by two components of the preferred alternative. First, modified intrasystem regulation causes a 3-year pattern in lower and higher releases from the upper three lakes. For example, in the year of a rising pool at Fort Peck Lake releases are lower than the subsequent 2 years when higher releases are required to ensure rising pools at either Lake Sakakawea or Lake Oahe. Second, spring releases are higher in non-drought years to achieve the spring rise in the lower river. Correspondingly, summer and fall flows would be lower. Overall, the net differences over the 96-year period are not very great.

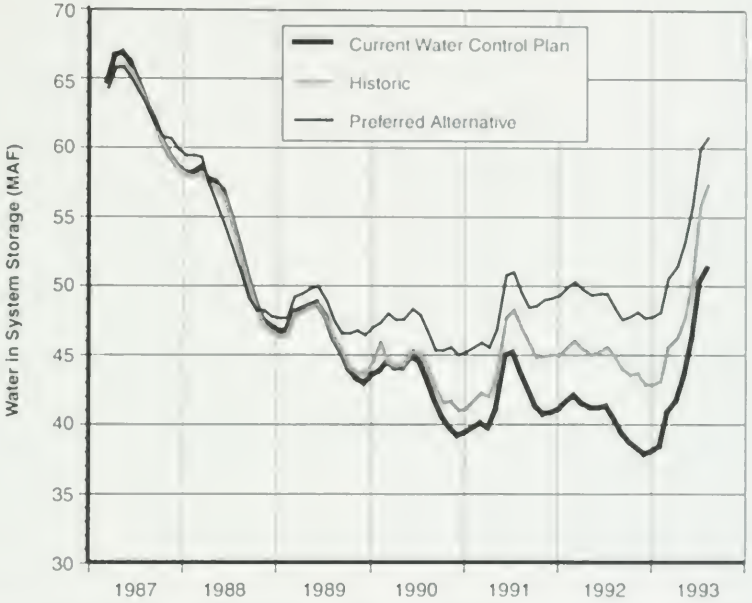
Table 3

Comparison of the Preferred Alternative to the current Water Control Plan and Maximum Values.
Based on data for the period 1898 to 1993.

	Flood Control	Navi-gation	Hydro-power	Water Supply	Recre-ation	Total NED	Physical Habitat	Tern/ Plover	Wetland Habitat	Warm River	Cold River	Young-of-Year	Cold Lake	Riparian Habitat	Historic Properties
	($ millions)						(Index)	(acres)	(1,000's acres)	(miles)	(miles)	(index)	(MAF)	(1,000's acres)	(Index)
Maximum Attainable Values	44.7	17.7	643.8	549.2	81.3	1,321	70.8	1,450	186	62.3	201	2.23	13.2	108	4,743
Current Water Control Plan	44.4	17.7	619.8	546.2	75.7	1,304	59.0	432	155	49.4	187	1.96	9.9	108	4,689
Preferred Alternative	42.6	15.0	620.6	546.7	77.7	1,303	64.1	587	166	58.8	187	2.03	10.6	96	4,484
Preferred Alternative % of Maximum Attainable	95%	85%	96%	100%	96%	99%	90%	41%	89%	94%	93%	91%	80%	89%	95%
Preferred Alternative % of Current Water Control Plan	96%	85%	100%	100%	103%	100%	108%	136%	107%	119%	100%	104%	107%	89%	96%

Figure 9

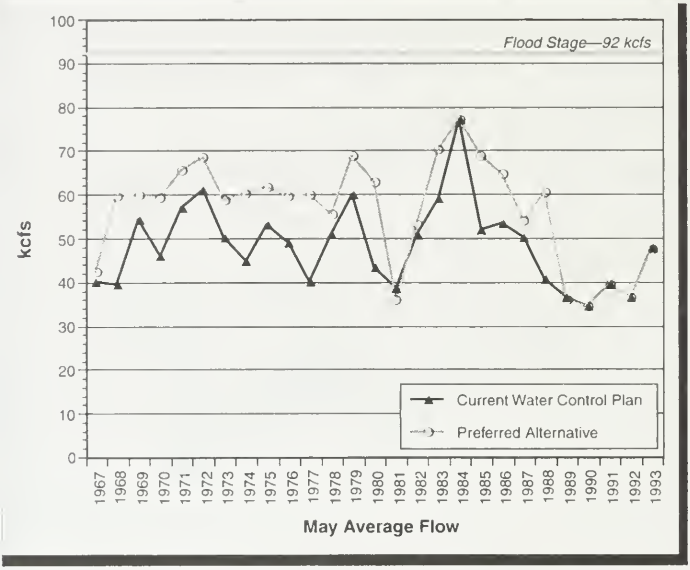
Monthly average Mainstem System water in storage for current Water Control Plan and preferred alternative for the period March 1987 through August 1993



Lower river flows are affected primarily by the spring rise and subsequent reduction in navigation service and season length in most years. Spring flows in over half of the 96 years are increased to mimic a more natural flow pattern. The effects of the spring rise are shown in Figure 10 for Nebraska City. Mainstem System releases continue to be constrained in some months by flood control criteria when downstream flooding is a problem, however flooding is not a problem in many of the months with the spring rise. The impacts of the spring rise become less noticeable farther downstream from Gavins Point Dam because of the increasing influence of tributary inflows into the lower Missouri River. The modified navigation service criteria impacts lower river flows by reducing the Mainstem System releases in even minor droughts. This saves water should a drought persists, and this effect is most noticeable in 1937 when the preferred alternative has a navigation year and there is no navigation under the current Water Control Plan.

Figure 10

Simulated monthly average May Missouri River flow at Nebraska City (1967 to 1993).



Changes in Missouri River flows affect Mississippi River flows. Mississippi River navigation is impacted if flow at St. Louis falls below 90 kcfs. At 44 kcfs or less, the Mississippi River is closed to commercial navigation. The preferred alternative generally provides lower flows in November than the current Water Control Plan, and this effect is shown for the Mississippi River in Figure 11.

Sedimentation, Erosion, and Ice Processes

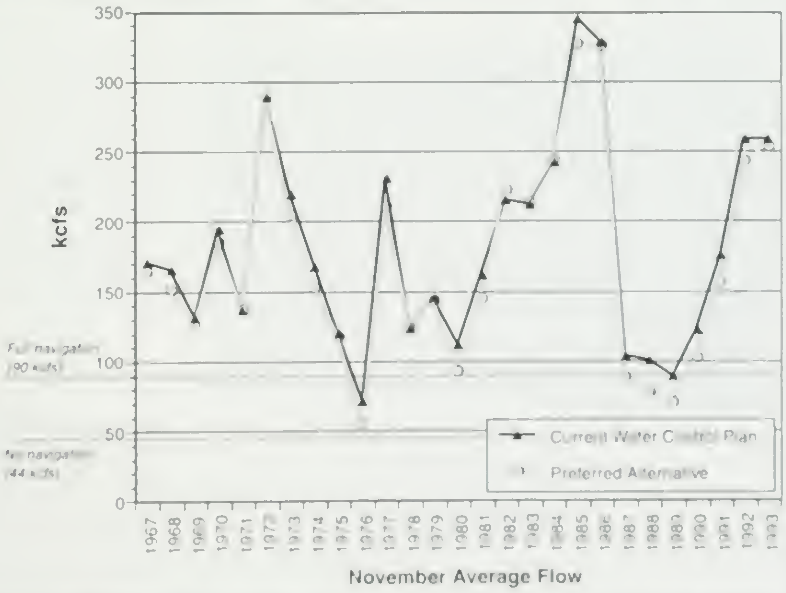
Significant changes in lake levels and river flow would occur in specific months as a result of a change to the preferred alternative, and these changes could have short-term impacts on sedimentation, erosion, and ice processes. Because these changes are generally short term (i.e., a high May flow replaces a comparable high September flow in a given year), changes in these processes are expected to be limited. Changes in precipitation patterns are more likely to impact these processes.

Reservoir storage losses due to sedimentation would continue at historic rates irrespective of how the Mainstem System is operated because this process is primarily a function of upstream watershed conditions and the rainfall/runoff process and not system operations. The preferred alternative would result in the upper three lakes averaging about 10 feet higher 30 percent of the time during the 96-year period. Sedimentation would, therefore, occur at somewhat higher elevations and further upstream in the lakes than under the current Water Control Plan. This would increase both surface and groundwater levels in the open river reaches immediately upstream from the lakes and exasperate existing problems in these areas. Within the lakes, the more consistent water surface levels over the entire period would minimize the redistribution of previously eroded sediments residing immediately below the waterline and provide some stability to the underwater slopes for the preferred alternative.

Sedimentation and erosion in the river reaches are also potentially affected by a change to the preferred alternative. Downstream from Fort Peck Dam, small changes in the flows would have a minor impact on the overall channel

Figure 11

Simulated monthly average November Mississippi River flow at St. Louis (1967 to 1993)



erosion or sediment deposition processes. Changes in flows are somewhat greater downstream from Garrison Dam, and increases of this magnitude could increase the bankline and bed erosion processes in this reach. Sediment movement changes in the reaches downstream from Fort Randall and Gavins Point Dams are expected to increase over present rates; however, the increases would not be substantial because of the minor differences in flows between the two plans. From Sioux City downstream, no change in bank erosion is expected in this well-controlled river reach. The slight increase in stage and velocity may slightly increase the bed degradation process in the Sioux City area and in the reach downstream.

Ice formation and movement processes are expected to be nearly identical under both plans because there is no basic difference in the operation of the Mainstem System during the winter months.

Water Quality

Differences in the amount of water in storage and river flow affect water quality of the Mainstem System. Increased amounts of water in storage reduce the potential for water quality problems via the resuspension of exposed sediments. Because there is some potential for one of the three upstream lakes to undergo an extreme drawdown in a year with the modified intrasystem regulation and a significant reduction in inflow, water quality in one of these lakes is more likely to be adversely impacted by even a single-year drought.

Water quality impacts were not a problem during the recent drought in any of the river reaches, and the lowest flows provided by both alternatives in most reaches are similar to those experienced in this drought. There are no data to verify whether there could be water quality problems in the summer months in the reach downstream from Sioux City; however, simulations indicate that the water quality standards for the lower river are met even at flows as low as 9 kcfs. Because the preferred alternative never has a nonnavigation year in the 96-year period and the resulting low nonnavigation service flows in the summer, the potential for water quality problems in this lower river reach is reduced for this plan.

Wetland and Riparian Habitat

The preferred alternative improves the average annual acreage of wetland habitat over the 96-year period by 7 percent over the 155,000 acres of the current Water Control Plan while reducing the riparian habitat by 11 percent from 108,000 acres. Gains in wetland habitat and loss of riparian habitat are greatest for the intrasystem river reaches (+12 and -14 percent, respectively) and lowest for the lake deltas (+2 and -6 percent, respectively). Increased wetland habitat acreage would occur in almost every year of the 96-year period. Wetland habitat acreage would decline and riparian habitat acreage would increase during the three major drought periods under both water control plans, however, the return to pre-drought values would be delayed for the preferred alternative.

The ratio of wetland to riparian habitat increased under the preferred alternative. It was 1.4 to 1 for the current Water Control Plan and increased to 1.7 to 1 under the preferred alternative. An increase in the ratio is a move toward a more natural mix, which is characterized by a ratio of 2.4 to 1 for a run-of-river alternative.

Cottonwood stands are expected to continue to diminish under both plans, however, the decline may be greater under the preferred alternative because of the anticipated increased bankline erosion of the river reaches. Also, the early growth of cottonwoods that colonizes exposed sediment during lower flow years is removed when high flows occur, and overall increase of the high flows are expected to increase this removal for all river reaches upstream from Sioux City.

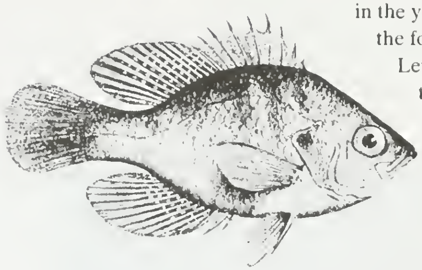
Wildlife Resources

Diverse species of wildlife depend on Missouri River floodplain habitats. The endangered interior least tern and threatened piping plover nest on exposed sandbars and are consequently directly affected by river flows. Periodic high flows are required to remove encroaching vegetation, but stable or declining flows are needed during the nesting season to avoid nest flooding. Other wildlife occurring in the floodplain rely more on the productive mix of wetland and riparian habitat maintained by river hydrology.

Piping plover—threatened species

Operation under the preferred alternative increases the amount of available tern and plover island nesting habitat from 432 acres to 587 acres, an increase of 36 percent. This increase occurs for all four river reaches currently used by terns and plovers for nesting with the greatest percentage increase in habitat occurring downstream from Gavins Point Dam (+285 percent) and the greatest absolute change occurring downstream from Garrison Dam (+61 acres). Year to year data show a distinct pattern of improved habitat every third year for the preferred alternative. This distinctive pattern can be traced back to the improved habitat in the reach downstream from Garrison Dam. Reduced releases combined with the vegetation scouring effects of the high flows 2 years earlier result in a dramatic increase in habitat in this reach every 3 years. The spring rise of the preferred alternative improves tern and plover habitat downstream from Fort Randall and Gavins Point Dams via the island vegetation scouring effect of the higher spring flows followed by the lower summer flows. Improved habitat occurs in 68 years downstream from Fort Randall Dam and in 93 of the 96 years downstream from Gavins Point Dam.

Young Fish Production in Mainstem Lakes



Young fish production was estimated for each of the six Mainstem System lakes. Modeling was based on relationships between various hydrologic variables and measured production of several species felt to be indicative of the variety of fish predominant in each lake. Comparison of the average annual values of the combined young fish production indices for both plans shows that the preferred alternative provides a 4 percent increase in the young fish production index. Production increases at the four larger lakes and decreases at Lake Sharpe and Lewis and Clark Lake. The year-to-year variation in the total annual values shows a distinctive increase every third year. This corresponds to the increased value at Lake Oahe, which has a dominant increase in these years corresponding to a rising pool in the modified intrasystem regulation component of the preferred alternative. Lake Sakakawea also has a noticeable but much smaller increase in 25 of the 32 years it has a rising pool; however, Fort Peck Lake does not exhibit this characteristic. Production would be lower in Lake Sharpe because of an increase in the flushing rate through the lake in response to the spring rise. Increased values for this lake occur in years with reduced releases in response to downstream flooding. Values for Lake Francis Case increase in years with higher releases. Finally, changes at Lewis and Clark Lake are very small.

Coldwater Fish Habitat in Mainstem Lakes

The annual minimum amount of coldwater habitat with a specified combination of dissolved oxygen and temperature was estimated for the four larger lakes for both plans. The total average annual value for the preferred alternative is 7 percent higher than that of the current Water Control Plan. The increase is due to higher average annual amounts of water in storage resulting from higher pool levels in the major drought periods. Results indicate that only the upper three lakes have coldwater habitat on a consistent basis, and Fort Peck Lake and Lake Sakakawea have the largest and similar increases in the average annual habitat volume for the preferred alternative. Lake Oahe has a relatively small average annual increase. The most notable difference in the annual values for a change to the preferred alternative occurs in the three major drought periods in response to the modified navigation service criteria. Higher pool levels early in the 1930s and early 1940s drought and in the subsequent droughts beginning in the mid-1950s and late 1980s result in higher minimum levels of coldwater reservoir fish habitat in all three lakes. Modified intrasystem regulation does not predominantly impact the amount of coldwater stored in the individual lakes on a year-to-year basis.

Coldwater Fish Habitat in River Reaches

The number of miles of coldwater river fish habitat (combination of dissolved oxygen levels and temperature that varies from month-to-month) for the 6 months from April through September was modeled for the two reaches downstream from Fort Peck and Garrison Dams. Higher and colder lake releases result in more miles of coldwater river fish habitat. A change to the preferred alternative results in no change in the total amount of coldwater river fish habitat. An increase in the average annual value occurs downstream from Fort Peck Dam for a change to the preferred alternative and coldwater habitat decreases downstream from Garrison Dam. Droughts have a negative effect on both the temperature and the amount of water released from these lakes; therefore, the river coldwater habitat decreases in droughts. In general, the amount of coldwater river fish habitat is higher in droughts for the preferred alternative with its higher amounts of (and colder) water in storage in both lakes and more variable rate of release from the lakes.

Warmwater Fish Habitat in River Reaches

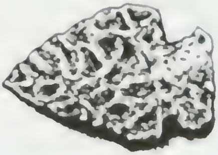
Total warmwater river fish habitat downstream from Fort Peck, Garrison, and Fort Randall Dams meeting variable temperature and dissolved oxygen requirements was computed for both plans. Warmwater river fish habitat increases significantly under the preferred alternative. A 20 percent increase occurs in the average annual value (49 miles for the current Water Control Plan to 59 miles for the preferred alternative) for the change in the water control plan. None of the increase occurs downstream from Fort Peck Dam. Major increases of 52 and 42 percent occur for the reaches downstream from Garrison and Fort Randall Dams, respectively. Year-to-year changes occur in differing ways downstream from the three dams. The reach downstream from Fort Peck Dam shows noticeable increases in the number of miles of habitat in the three major drought periods. Downstream from Garrison Dam, the third-year pattern is predominant with the highest values occurring in the lower release years. No specific pattern occurs downstream from Fort Randall Dam except high values occur consistently for the preferred alternative in most of the years of the 1930s and early 1940s drought.

Physical Habitat for Native River Fish

Habitat diversity is considered to be essential for the continued existence of many native riverine fish species, which include the endangered pallid sturgeon and other candidate species. For four reaches upstream from Sioux City (three intrasystem and one lower river), velocity distributions were used as an estimate for this diversity. Downstream from Sioux City, estimates of optimal flows were developed for five contiguous river reaches. The model computes higher values for alternatives that have an annual flow pattern that approximates the historic natural flow pattern of higher spring flows and lower flows the remainder of the year. The preferred alternative provides an 8 percent increase in the combined average annual physical habitat index value for the nine river reaches.

Improvements in physical habitat occur in all nine river reaches with the greater improvements occurring downstream from Sioux City. The improvements are significant (16 to 25 percent) for the reaches from Sioux City to downstream from Boonville for a change to the preferred alternative. The preferred alternative increases the total annual average river fish physical habitat value in 79 of the 96 years analyzed. Differences between the two plans diminish in the most severe drought of the 1930s and early 1940s except in the one nonnavigation year of the current Water Control Plan (1937). Lower values generally occur in the years of increased summer and fall releases for flood storage evacuation and extended droughts. Improved values occur in the individual reaches in half to three-fourths of the 96 years modeled for a change to the preferred alternative with the exception of the Hermann reach where the flows are more “natural” because tributary inflows increase in the downstream reaches and are more “natural” than the Mainstem System lake releases. This reach has 38 years in which the values were the same for both plans and 23 years of reduced values for a change to the preferred alternative. Values increase in six or more of the nine river reaches in nine of the months for a change to the preferred alternative. Fewer reaches increase in value in January (4), February (3), and July (1). July is generally a poor performance month in terms of physical habitat because the increased releases to create the spring rise result in a cutback to the minimum navigation service level instead of full service in this month in many years. Optimal flows for July river fish physical habitat are generally greater than required for even the full navigation service level.

Historic Properties



Historic properties located within the Mainstem System lakes and immediately adjacent zones are subject to the adverse effects of shoreline erosion and inundation. Of these two factors, the long-term potential for erosion at each known site was evaluated based on the monthly water level in each of the three upstream lakes. An index value was computed that converts the number of "hits" by erosional forces to a value that is indirectly proportional to this number to allow the index to provide higher values for "better" effects on known historic properties at these lakes. A change from the current Water Control Plan to the preferred alternative decreases the average annual index value by 4 percent from 4,689 units to 4,484. This loss occurs primarily at Lake Oahe. Essentially, no change occurs at Fort Peck Lake to known sites, which are extremely limited; therefore, the remainder of the lost units occurs at Lake Sakakawea. These two losses translate to a loss of 4 percent at Lake Sakakawea and 8 percent at Lake Oahe, both having a significant number of known sites compared to Fort Peck Lake.

Flood Control

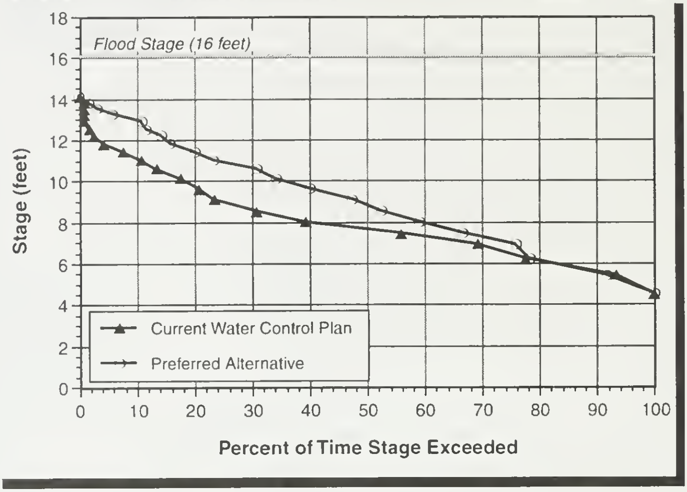
Flood control benefits were computed for the river reaches downstream from five of the dams (not Big Bend Dam). The reach downstream from Gavins Point Dam to the mouth was subdivided into eight reaches. A change to the preferred alternative results in a 4 percent decrease of the total average annual flood control benefits for all twelve reaches.

A detailed analysis was done for the reach at Bismarck because increased flooding at this location is the primary cause for increased damages downstream from Garrison Dam. Damaging flood events (consecutive months of flooding are just one event) since October 1953 increase from 10 under the current Water Control Plan to 16 under the preferred alternative. The months with increased flood events are the spring months, the result of the spring rise and modified intrasystem regulation. Figure 12 shows a frequency distribution of peak monthly stages at Bismarck for April, May, and June for the two water control plans. Peak stages at Bismarck are about 2 feet higher with the preferred alternative about 40 percent of the time for the period of peak flow records since 1953.

Expressed concern for the impacts of the spring rise on lower river farmland flooding resulted in a detailed analysis for the Nebraska City reach. This analysis determined that the number of flood events since October 1928 stays the same at 65 events. These events occur in 47 years under the current Water Control Plan and in 49 years under the preferred alternative. This increase in the number of years is a redistribution of the flood events, which results in an increase in the number of flood events in the spring months. Changes in the spring flood events include 2 fewer events in March, 4 more in April, 3 more in May, and 2 less in June. Total flood damages for all 65

Figure 12

Frequency plot of peak stage for spring (April through June) in Missouri River at Bismarck, North Dakota. Based on simulations for the period 1953 to 1993.



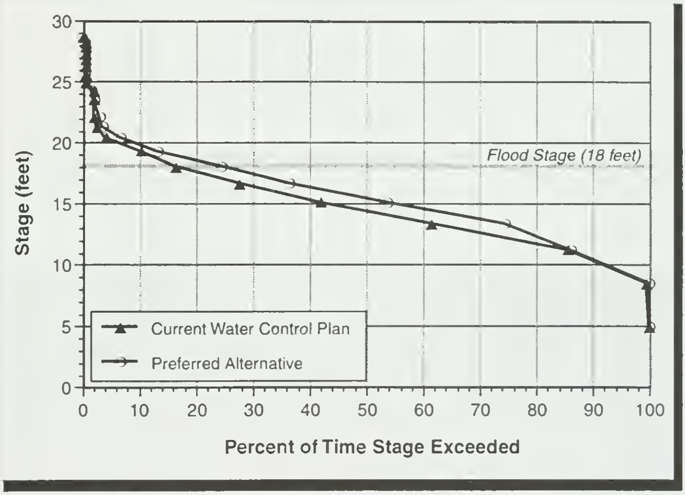
events increases from $146 million to $151 million for the change to the preferred alternative. Figure 13 shows a frequency distribution of peak river stages at Nebraska City for April, May, and June for the two water control plans for the 66 years of historic peak flow records. River stages at Nebraska City are about 1 foot higher with the preferred alternative about 60 percent of the time.

One factor that was not modeled is the effect of river flows on interior drainage problems which can cause flood damages. The Nebraska City reach is about 5 days downstream from Gavins Point Dam in terms of flow time. If reductions in releases to either full or minimum service to navigation can eliminate the interior drainage problem, interior drainage may be a problem for a maximum of 5 days. If it is due to continued high tributary flows, the problem would be identical under both plans.

A concern was also raised regarding the potential impact of higher Missouri River flows on the evacuation of stored flood waters in the Kansas River and Osage River basins. In the case of the Kansas River projects, releases are curtailed when flows at Waverly, Missouri (near Kansas City) exceed 100 kcfs. During the spring rise months, the number of months averaging 90 kcfs or more is 44 for the current Water Control Plan at Kansas City and 65 for the preferred alternative. This increase of 21 months out of a possible 384 months during the 4-month spring rise period (March through June) is an increase of 5 percent of the time that evacuation could be limited for potential long periods. (The higher the average monthly flow the longer the potential period of flows greater than 100 kcfs.) A similar analysis of the Hermann data, which dictates constraints on evacuation from the Osage River basin, determined that there are almost no months in which evacuation is limited for a long period and there is essentially no difference between the two plans.

Figure 13

Frequency plot of peak stage for spring (April through June) in Missouri River at Nebraska City, Nebraska. Based on simulations for the period 1928 to 1993.



Water Supply

Water supply benefits were determined for the intake facilities along the Mainstem System for all of the lake and river reaches between the headwaters of Fort Peck Lake and the mouth of the Missouri River at St. Louis. Total benefits are the same for both plans. For many reaches there is also very little, if any, difference in benefits between the two plans. In some reaches, however, there are noticeable differences, but they are not very great. Under the preferred alternative, benefits would increase 4 percent at Fort Peck Lake and Lake Oahe while declining 2 percent at Lake Francis Case. Examination of the differences between the two plans in terms of the various types of use (power, municipal, commercial/industrial, irrigation, and domestic) also shows no difference. Subtle differences occur in differing years for the two plans. The most notable is the effects on the lower river in 1937 under the current Water Control Plan. This is a nonnavigation year under this plan; therefore, the summer nonnavigation service level criteria were followed. The 9-kcfs target does not provide adequate flows for some major powerplants. Also, two powerplant intakes had to be lowered. An increase in the water supply benefits for the preferred alternative relative to the current Water Control Plan result in the June through October 1937 period totaling $166 million. This amounts to less than $2 million per year over the 96-year period of analysis, and there are offsetting decreased benefits in some other periods as well as other periods of increased benefits for the preferred alternative.

Hydropower

Total average annual Mainstem System hydropower benefits are essentially the same for both plans. This results in essentially no differences in the hydropower benefits provided by the individual dams or to the States receiving this hydropower. The largest reduction in annual average benefits occurs in the most extreme drought modeled, the drought of the 1930s and early 1940s. The preferred alternative provided greater benefits during all three

Generators in a dam powerhouse

major droughts. These beneficial differences are offset by a reduction in benefits in most non-drought periods. In general, the increase in benefits in a major drought year is greater than the reduction in benefits in each non-drought year. The preferred alternative provides less variability over the entire period with the range in annual benefits being smaller for the preferred alternative ($451 million to $724 million) than it is for the current Water Control Plan ($389 million to $730 million).

Review of the capacity and energy data shows major differences between the two plans. The preferred alternative increased the average annual capacity in every month with the increases ranging from 23 to 80 MW. A critical factor from a power marketing standpoint is the marketable capacity available. This is currently determined by the minimum summer and winter values in 1961. The current Water Control Plan reduces the amount currently marketed in the summer from 2,070 MW to 1,960 MW while the preferred alternative increases this value to 2,130 MW. Both plans have higher winter values than the current value of 2,010 MW—2,044 MW for the current Water Control Plan and 2,208 MW for the preferred alternative. The month-to-month distribution of energy generated by the Mainstem System hydropower units was altered by a change to the preferred alternative. The largest changes consisted of moving energy generated from the fall months to the spring months.

Recreation

Recreation benefits were computed for all of the lake and river reaches. Under the current Water Control Plan, the lakes provide 73 percent of the over $75 million of average annual benefits for the 96-year period. The combined average annual benefits for all reaches increase by $1.9 million (+3 percent) for a change to the preferred alternative. This increase occurs for the three upstream lakes with Lake Sakakawea having the greatest improvement in benefits, +$1.8 million (+15 percent). The preferred alternative improves lake recreation benefits significantly in the major droughts. For example, the preferred alternative provides an additional $34.0 million of benefits at the upper three lakes in

Water recreation

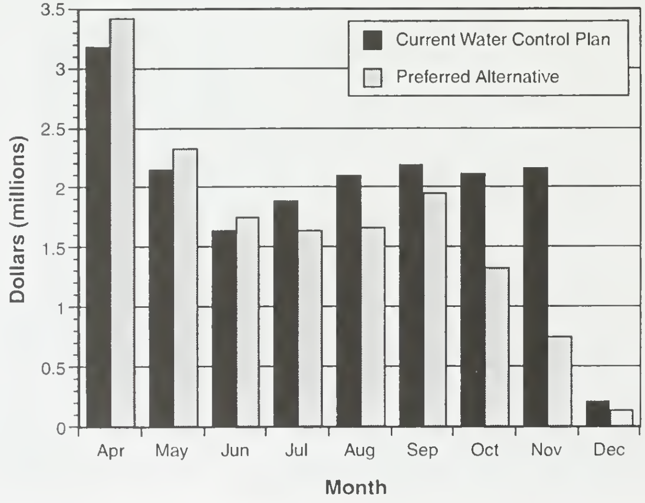
1936, which was the year in which these lakes declined to their lowest levels. Intrasystem and lower river recreation losses are very small on an average annual basis. By eliminating the subsequent nonnavigation year of the current Water Control Plan, the preferred alternative even improves benefits for lower river recreation. These increases total $1.0 million (+29 percent compared to the value for the current Water Control Plan) for the reach downstream from Gavins Point Dam and $2.3 million (+31 percent) for the Sioux City reach in 1937.

Navigation

Average annual benefits for Missouri River navigation are reduced by 15 percent under the preferred alternative. Figure 14 shows a monthly distribution of the average annual benefits. Reduced service levels in the latter half of the navigation season in many years is a factor in this loss of benefits. Full service seasons are reduced from 39 to 14 and partial service years are increased from 56 to 82. The preferred alternative provides service in all 96 years while the current Water Control Plan has a nonnavigation year in 1937. A reduction of the normal navigation season length is also a factor. The number of 8-month or longer navigation seasons is cut from 89 under the

Figure 14

Average annual navigations benefits by month (April through December). Based on simulations for the period 1898 through 1993).



current Water Control Plan to 33 under the preferred alternative. This is a primary factor for the reduction of average annual November benefits under the preferred alternative, as shown in Figure 14. The modified navigation service criteria of the preferred alternative also reduce benefits in the drought periods. Even though they are a factor in eliminating the complete loss of benefits in 1937, their effects on navigation service level and season length outweigh this improvement.

Missouri River flows also affect Mississippi River navigation. Modeling results of both plans demonstrate that Mississippi River navigation is relatively unaffected (less than 1 percent in terms of average annual benefits) over the 96-year period of analysis.

Total NED Economics

All of the economic use benefits discussed above are NED benefits. When the average annual benefits for the five uses are totaled, the net result is no change in total NED benefits between the two plans. The preferred alternative increases the benefits in the drought periods and this improvement is offset by reduced benefits in the non-drought periods. This results is a reduction in the range of economic benefits provided in each of the 96 years by the Mainstem System. The minimum benefits provided by the current Water Control Plan in the most severe of the three droughts is $982 million, and the minimum value for the preferred alternative is $1,214 million. Maximum numbers for the two plans occur in 1975 and are very similar at $1,564 and $1,560 million, with the lower value being for the preferred alternative. The distribution of the total NED benefits among eight basin States is presented in Table 4. This table also includes the economic benefits for each use to show the makeup of the total value for each State. Also shown is the distribution of the benefits for the alternative that maximizes the total benefits for each use.

Table 4.

Benefits by states (in $Millions)

(MAX = Maximum attainable; CWCP = Current Water Control Plan; PA = Preferred Alternative)

		Montana	Wyoming	North Dakota	South Dakota	Nebraska	Iowa	Kansas	Missouri
NAVIGATION	**MAX**	0	0	0	0.2	4.4	4.2	2.8	6.2
	CWCP	0	0	0	0.2	4.4	4.2	2.8	6.2
	PA	0	0	0	0.1	3.7	3.5	2.3	5.3
FLOOD CONTROL	**MAX**	0.5	0	1.3	5.6	13.0	10.7	3.8	9.9
	CWCP	0.5	0	1.4	5.6	12.8	10.5	3.8	9.9
	PA	0.5	0	1.2	5.6	12.1	9.8	3.7	9.7
HYDROPOWER	**MAX**	46.9	0	83.1	119.5	177.5	81.3	0	0
	CWCP	45.6	0	80.3	115.3	168.9	78.9	0	0
	PA	45.4	0	80.3	115.3	170.1	78.8	0	0
RECREATION	**MAX**	3.3	0	23.9	28.2	11.3	4.0	0.6	2.5
	CWCP	2.7	0	20.0	27.3	11.7	4.2	0.6	2.5
	PA	3.0	0	21.7	27.5	11.4	4.1	0.6	2.5
WATER SUPPLY	**MAX**	3.2	4.4	29.7	24.8	245.6	89.8	12.9	87.0
	CWCP	3.1	4.4	28.5	24.0	245.2	89.7	12.6	86.7
	PA	3.2	4.4	28.5	24.0	245.5	90.0	12.6	86.6
TOTAL	**CWCP**	52	4	130	172	443	188	20	105
	PA	52	4	132	173	443	186	19	104

APPENDIX B

DOMINANT DISCHARGE HYDROGRAPHS

APPENDIX B

Table B-1 contains a summary of DFWP's channel maintenance requests. This information was included in DFWP's application which was submitted to DNRC in June of 1991. DFWP used preliminary information from USGS to develop its application. Since that time, USGS revised the preliminary information. Table B-2 contains the new USGS estimates of channel maintenance flows.

Table B-1. Summary of DFWP channel maintenance requests

Flows derived from Battle Creek using the Base Flow Approach

Day	CFS	AF
45	89	
2	95	188
3	470	932
4	930	1,845
5	1,970	3,907
6	1,330	2,638
7	650	1,289
8	180	357
9	130	258
10	90	179
11	75	149
12	65	129
13	60	119
14	50	99
		12,178

Flows derived from Beaver Creek #2, Phillips County, using the Base Flow Approach

Day	CFS	AF
1	40	79
2	160	317
3	400	793
4	1,160	2,301
5	920	1,825
6	440	873
7	320	635
8	240	476
9	200	397
10	160	317
11	120	238
12	85	169
13	75	149
14	55	109
15	45	89
16	30	60
17	25	50
18	20	40
19	15	30
		8,947

Flows derived from Frenchmen River using the Base Flow Approach

Day	CFS	AF
1	30	60
2	45	89
3	70	139
4	110	218
5	240	476
6	450	893
7	690	1,369
8	1,150	2,281
9	2,050	4,066
10	1,570	3,114
11	1,180	2,340
12	900	1,785
13	730	1,448
14	560	1,111
15	430	853
16	310	615
17	240	476
18	190	377
19	150	298
20	110	218
21	95	88
		22,414

Flows derived from Rock Ceek using the Base Flow Approach

Day	CFS	AF
1	15	30
2	25	50
3	80	159
4	780	1,547
5	2,180	4,324
6	2,960	5,871
7	1,970	3,907
8	1,320	2,618
9	760	1,507
10	480	952
11	310	615
12	200	397
13	140	278
14	100	198
15	80	159
16	55	109
17	45	89
18	35	69
19	25	50
20	20	40
21	20	40
		23,248

Flows derived from Redwater River #1 using the Base Flow Approach

Day	CFS	AF
1	5	10
2	90	179
3	890	1,765
4	1,440	2,856
5	1,730	3,431
6	870	1,726
7	170	337
8	60	119
9	50	99
10	40	79
11	40	79
12	30	60
13	30	60
14	30	60
		10,860

Flows derived from Redwater River #2 using the Base Flow Approach

Day	CFS	AF
1	5	10
2	100	108
3	1,040	2,063
4	1,680	3,332
5	2,010	3,987
6	1,010	2,003
7	200	397
8	70	139
9	60	119
10	50	99
11	40	79
12	40	79
13	40	79
14	30	60
		12,644

Flows derived from East Fork Poplar River using the Base Flow Approach

Day	CFS	AF
1	6	12
2	10	20
3	60	119
4	280	555
5	540	1,071
6	330	655
7	200	397
8	80	159
9	60	119
10	20	40
11	9	18
12	7	14
13	6	12
		3,191

Flows derived from Middle Fork Poplar River using the Base Flow Approach

Day	CFS	AF
1	40	79
2	150	298
3	670	1,329
4	1,000	1,983
5	670	1,329
6	320	635
7	160	317
8	110	218
9	80	159
10	60	119
11	50	99
12	30	60
13	20	40
14	20	40
		6,705

Flows derived from Poplar River using the Base Flow Approach

Day	CFS	AF
1	50	99
2	190	377
3	810	1,607
4	1,210	2,400
5	810	1,607
6	390	774
7	190	377
a	130	258
9	100	198
10	70	139
11	40	79
12	30	60
13	20	40
14	20	40
		8,055

Flows derived from West Fork Poplar River using the Base Flow Approach

Day	CFS	AF
1	50	99
2	180	357
3	800	1,587
4	1,190	2,360
5	800	1,587
6	380	754
7	190	377
8	120	238
9	100	198
10	70	139
11	40	79
12	30	60
13	30	60
14	20	40
		7,935

Flows derived from Little Missouri River using the Base Flow Approach

Day	CFS	AF
1	10	20
2	15	30
3	20	40
4	75	149
5	290	575
6	1,450	2,876
7	2,540	5,038
8	2,320	4,602
9	1,670	3,312
10	1,150	2,281
11	940	1,864
12	760	1,507
13	600	1,190
14	430	853
15	280	555
16	240	476
17	200	397
18	280	555
19	240	476
20	200	387
21	150	298
		27,491

Flows derived from Box Elder Creek using the Base Flow Approach

Day	CFS	AF
1	25	50
2	55	109
3	170	337
4	340	674
5	850	1,686
6	1,820	3,610
7	1,480	2,936
a	1,220	2,420
9	860	1,706
10	640	1,269
11	380	754
12	160	317
13	120	238
14	55	109
15	35	69
16	15	30
17	10	20
		16,334

Flows derived from Little Beaver Creek using the Base Flow Approach

Day	CFS	AF
1	7	14
2	9	18
3	620	1,230
4	2,050	4,066
5	3,310	6,565
6	1,080	2,142
7	250	496
8	160	317
9	110	218
10	75	149
11	55	109
12	41	81
13	35	69
14	30	60
15	25	50
16	20	40
17	20	40
18	is	30
19	15	30
		15,724

Flows derived from Beaver Creek, Wibaux County, using the Base Flow Approach

Day	CFS	AF
1	10	20
2	15	30
3	35	69
4	130	258
5	390	258
6	790	1,567
7	1,050	2,083
8	660	1,309
9	330	655
10	130	258
11	65	129
12	53	105
13	40	79
14	35	69
		7,405

Table B-2. Revised USGS channel maintenance flows

Site No.	Stream name	Day	Daily mean discharge in cubic feet per second
18	Little Missouri River at Montana-South Dakota border	1	10
		2	15
		3	20
		4	75
		5	290
		6	1,450
		7	2,540
		8	2,320
		9	1,670
		10	1,150
		11	940
		12	760
		13	600
		14	430
		15	280
		16	240
		17	200
		18	280
		19	240
		20	200
		21	150
19	Boxelder Creek near Webster, Mont	1	6
		2	25
		3	55
		4	170
		5	340
		6	850
		7	1,910
		8	1,480
		9	1,220
		10	860
		11	640
		12	380
		13	160
		14	120
		15	55
		16	35
		17	15
		18	10
		19	5
		20	4
		21	3

Table B-2 continued

Site No.	Stream name	Day	Daily mean discharge in cubic beet per second
10	Rock Creek at mouth near Hinsdale, Mont.	1	15
		2	25
		3	80
		4	780
		5	1,900
		6	2,560
		7	1,750
		8	1,260
		9	760
		10	480
		11	310
		12	200
		13	140
		14	100
		15	80
		16	55
		17	45
		18	35
		19	25
		20	20
		21	20
11	Redwater River above confluence of East Fork Redwater River near Vida, Mont	1	0
		2	20
		3	60
		4	180
		5	370
		6	780
		7	540
		8	340
		9	230
		10	120
		11	100
		12	80
		13	60
		14	40
12	Redwater River near Vida, Mont	1	5
		2	70
		3	110
		4	300
		5	490
		6	900
		7	700
		8	480
		9	290
		10	180
		11	150
		12	130
		13	110
		14	90

Table B-2 continued

Site No.	Stream name	Day	Daily mean discharge in cubic feet per second
5	Battle Creek at mouth near Chinook, Mont	1	40
		2	90
		3	210
		4	470
		5	1,520
		6	710
		7	260
		8	130
		9	100
		10	85
		11	70
		12	60
		13	55
		14	45
7	Frenchmen River at mouth near Saco, Mont	1	10
		2	30
		3	50
		4	70
		5	150
		6	290
		7	450
		8	740
		9	1,320
		10	1,010
		11	760
		12	580
		13	470
		14	360
		15	280
		16	200
		17	160
		18	120
		19	90
		20	70
		21	60

Table B-2 continued

Site No.	Stream name	Day	Daily mean discharge in
9	Beaver Creek at mouth near Saco, Mont	1	10
		2	190
		3	880
		4	2,210
		5	1,750
		6	1,180
		7	640
		8	500
		9	390
		10	300
		11	210
		12	180
		13	150
		14	120
		15	100
		16	80
		17	60
		18	40
		19	20
		20	10
		21	10
13	Poplar River above confluence of East Poplar River near Scobey, Mont	1	40
		2	150
		3	670
		4	1,000
		5	670
		6	320
		7	160
		8	110
		9	80
		10	60
		11	50
		12	30
		13	20
		14	20
14	East Poplar River at mouth near Scobey, Mont	1	2
		2	6
		3	10
		4	60
		5	280
		6	5.40
		7	330
		8	200
		9	80
		10	60
		11	20
		12	9
		13	7
		14	5

Table B-2 continued

Site No.	Stream name	Day	Daily mean discharge in
15	Poplar River at Fort Peck Reservation boundary near Scobey, Mont	1	*50*
		2	200
		3	880
		4	1,930
		5	1,530
		6	1,000
		7	820
		8	600
		9	400
		10	300
		11	220
		12	170
		13	120
		14	70
16	West Fork Poplar River at Fort Peck Reservation boundary near Four Buttes, Mont	1	*5*
		2	90
		3	450
		4	850
		5	570
		6	480
		7	350
		8	200
		9	170
		10	140
		11	110
		12	50
		13	60
		14	40

APPENDIX C

EFFECTS OF FLOW REDUCTIONS ON SAUGER SPAWNING HABITAT

APPENDIX C

The methods used by DFWP to determine flow requirements of sauger were described by Gardner and Stewart (1987) and are reprinted below.

> Sauger and walleye spawning/incubation reefs
>
> Major spawning/incubation areas used by sauger, and to a lesser extent, walleye, were located at rocky reef areas. There is considerable sauger spawning use in the reef areas. Electrofishing catch rates of adults during the spawning season averaged about 25 fish/hr compared to about 6 fish/hr during the summer and fall. Kick samples for incubating eggs yielded up to 20 eggs/sample, and later, larval fish tows at these sites captured upwards to 15 sauger larval for a 10-minute tow. The reefs where spawning activity was noted were associated with eroding cliffs of a hard sandstone formation which bordered the river and were limited to eight sites in the study area (Figure 19). Known spawning/incubation areas were confined to about 5 miles of river bank in the 184-mile study area. This was considered limiting and underscores the significance of maintaining adequate spawning flows in these important areas.
>
> Two representative spawning/incubation reefs were studied and relationships between flow and spawning/incubation habitat conditions were investigated. The specific spawning/incubation areas were rocky substrate areas along the margins of the river channel. The width of these rocky areas did not extend indefinitely across the channel, but were limited to the shoal areas of the river channel. At each of the two sites, three cross sections were located, usually about equidistant from each other. The elevations of the lower (outer) border and higher (inner) border of the rocky substrate areas were determined for sites, usually 20 yards, above and below the cross section and at the cross section line. These three measurements were averaged and therefore described the rocky substrate area in the general vicinity of the cross section line. The surveyed measurements of the sauger spawning/incubation area were logged on the channel profile, and state/discharge modelling was performed to predict the river flow which would provide a 2-foot water depth at the lower border of the spawning area. A 2-foot depth criteria was selected as minimum spawning/incubation condition because sauger eggs were usually sampled at 2- to 3-foot water depth in the major spawning sites of the study area. Also, Scott and Crossman (1974) report that sauger spawning occurs in water 2- to 12-foot deep.
>
> Table 55 summarizes the results of the instream flow analysis for the spawning/incubation reefs. The flows which would maintain a 2-foot depth over the lower border of the reef varied in magnitude for the cross sections within a particular reef site. An average instream flow was determined from the three predicted flow values (one for each cross section) at each individual reef site. Flows which would provide adequate spawning/incubation conditions at the reef sites were 10,986 cfs at the Brockton reef and 11,497 cfs at the Culbertson reef. Instream flows during the sauger and walleye spawning/incubation season should be 11,497 cfs at both the Wolf Point and Culbertson USGS gauging stations. The duration of these flows should be maintained during the spawning and incubation period, May 11 through June 30.

Table 55. River stage height and corresponding flows required to maintain adequate sauger spawning conditions at two representative spawning/incubation reefs.

Location	Benchmark Elevation (ft)	State height elevation of gravel boundaries (ft) Lower	Upper	River stage height (ft) which meets 2-foot minimum depth criteria at lower edge of spawning reef	Corresponding instream flow for sauger spawning
Brockton Reef					
Cross section #29 (above)[a]	22.15	18.15	19.59	20.15	
Cross section #29 (at)	22.15	18.37	19.04	20.37	
Cross section #29 (below)	22.15	17.11	21.02	19.88	
				Avg = 19.88	10,673 cfs[b]
Cross section #30 (above)	32.02	27.69	28.69	29.69	
Cross section #30 (at)	32.02	27.73	28.19	29.73	
Cross section #30 (below)	32.02	27.59	31.36	29.59	
				Avg = 29.67	11,367 cfs
Cross section #31 (above)	24.65	22.52	24.92	24.52	
Cross section #31 (at)	24.65	22.34	23.34	24.34	
Cross section #31 (below)	24.65	22.38	22.84	24.38	
				Avg = 24.41	10,917 cfs
					Avg = 10,986 cfs
Culbertson Reef					
Cross section #39 (at)	22.95	20.57	22.24	22.57	
Cross section #39 (below)	22.95	20.72	22.06	22.72	
				Avg = 22.64	13.483 cfs
Cross section #40 (at)	21.90	15.21	18.73	17.21	
Cross section #40 (below)	21.90	16.40	18.41	18.40	
				Avg = 17.80	10,286 cfs
Cross section #41 (above)	21.36	14.98	16.20	16.98	
Cross section #41 (at)	21.36	14.07	17.77	16.07	
Cross section #41 (below)	21.36	15.16	16.13	17.16	
				Avg = 16.74	10,722 cfs
					Avg = 11,497 cfs

[a] Measurements of spawning reef's boundaries usually taken 20 yds above cross section, at cross section, and 20 yds below cross section.

[b] Flow which corresponds to a given river stage height as determined by the stage/discharge computer model. Flows are interpolated from chart given in Appendix Table 50.

SOURCE: Gardner and Stewart 1984

The effect of a reduction of 200-250 cfs depends on the flow of the river and shape of the spawning reef area. For example, Figure C-1 illustrates a case in which a reduction of 200-250 cfs would have no effect on sauger spawning because water levels are already below the rock reef area used for spawning. Figure C-2 depicts the water levels on which DFWP made their request.

Table C-1 shows the stage height relative to six cross sections in two spawning reefs, and the stage corresponding to the lower edge of spawning habitat. The shaded area in the table indicates the stages where there would be no effect on spawning habitat from a 200-250 cfs reduction in flow. Generally, at flows above about 7,000 cfs, a reduction in flow of 200-250 cfs would drop water levels by less than an inch.

Table C-1. Stage height values for given flows generated from the DFWP WETP model for cross sections on the lower Missouri River at two sauger spawning reef sites, 1983

Average elevation of lower edge spawning reef	ft 17.88	ft 27.67	ft 22.41	ft 20.64	ft 15.80	ft 14.74
	By section #					
Predicted flow (cfs)	29 (ft)	30 (ft)	31 (ft)	39 (ft)	40 (ft)	41 ft
2,000	12.89	24.27	18.78			
2,200	13.21	24.54	19.06			
2,400	13.51	24.79	19.32	16.82	13.17	11.91
2,700	13.93	25.13	19.68	17.17	13.50	12.24
3,000	14.31	25.44	20.00	17.48	13.79	12.53
3,300	14.67	25.72	20.29	17.77	14.07	12.81
3,500	14.90	25.89	20.48	17.95	14.24	12.98
3,800	15.22	26.14	20.74	18.21	14.48	13.22
4,000	15.42	26.30	20.91	18.37	14.64	13.38
4,200	15.62	26.45	21.06	18.52	14.79	13.53
4,500	15.90	26.66	21.29	18.74	15.00	13.74
4,700	16.08	26.79	21.43	18.88	15.14	13.88
5,000	16.34	26.98	21.64	19.09	15.33	14.08
5,300	16.59	27.17	21.83	19.28	15.52	14.26
5,500	16.75	27.28	21.96	19.40	15.64	14.39
5,800	16.98	27.45	22.14	19.58	15.81	14.56
6,000	17.13	27.56	22.26	19.70	15.92	14.67
6,200	17.28	27.66	22.37	19.81	16.03	14.78
6,500	17.49	27.82	22.53	19.97	16.19	14.94
6,700	17.63	27.91	22.64	20.07	16.29	15.05
7,000	17.83	28.05	22.79	20.22	16.44	15.20
7,500	18.15	28.28	23.04	20.47	16.67	15.44
8,000	18.45	28.49	23.27	20.69	16.90	15.67
8,500	18.75	28.69	23.49	20.91	17.11	15.88
9,000	19.03	28.88	23.69	21.12	17.32	16.09
9,500	19.30	29.06	23.89	21.32	17.51	16.29
10,000	19.55	29.24	24.08	21.51	17.70	16.48
11,000	20.04	29.56	24.44	21.86	18.05	16.84
12,000	20.50	29.86	24.77	22.19	18.38	17.18
13,000	20.93	30.14	25.08	22.50	18.68	17.49
14,000	21.33	30.40	25.37	22.79	18.97	17.79
15,000	21.72	30.64	25.64	23.06	19.25	18.07

SOURCE: Gardner 1994

Figure C-1. Hypothetical river cross section at a sauger spawning reef that would not be affected by a 200-250 cfs reduction in flow

No sauger spawning will probably occur here because entire spawning reef is dry.

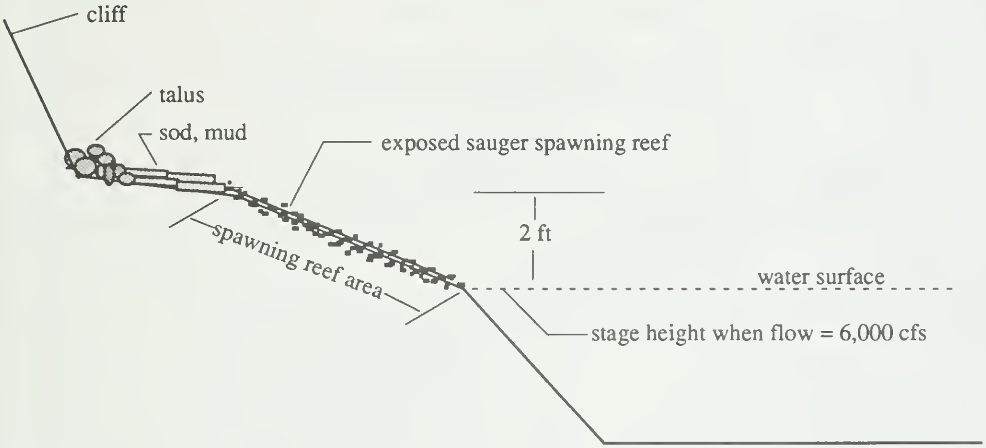
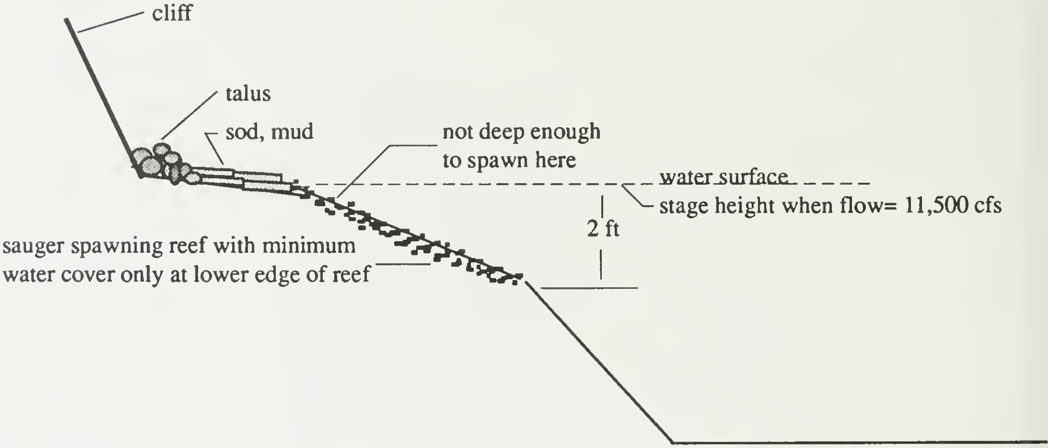

cliff
talus
sod, mud
exposed sauger spawning reef
2 ft
water surface
spawning reef area
stage height when flow = 6,000 cfs

Figure C-2. **Hypothetical river cross section at a sauger spawning reef that could be affected by a 200-250 cfs reduction in flow**

Some Sauger spawning will likely occur here because the lower edge of reef has the minumim 2 ft. depth.


cliff
talus
sod, mud
not deep enough to spawn here
water surface
stage height when flow= 11,500 cfs
2 ft
sauger spawning reef with minimum water cover only at lower edge of reef

APPENDIX D

TAX INFORMATION

D-1 COMPARISON OF TAXABLE VALUES FOR AGRICULTURAL LAND

In 1993 and after Legislative Changes effective January 1, 1994

COUNTY	CLASS 1 - 3, IRRIGATED LAND			CLASS 4, SUMMER FALLOW LAND			CLASS 5, GRAZING LAND			CLASS 6, WILD HAY LAND			CLASS 7, CONT. CROPPED LAND			COUNTY TOTALS		
	Taxable Values		% Change	Taxable Values		% Change	Taxable Values		% Change	Taxable Values		% Change	Taxable Values		% Change	Total Taxable		% Change
	1993	1994		1993	1994		1993	1994		1993	1994		1993	1994		1993	1994	
Blaine	$334,277	$308,364	-7.73%	$1,994,090	$1,952,439	-1.59%	$1,385,930	$1,417,629	2.29%	$174,967	$200,274	14.46%	$ 0	$ 0	ERR	3,889,262	3,868,706	-0.01%
Carter	0	0	ERR	278,795	390,020	40.22%	1,293,706	1,366,302	5.61%	142,058	172,632	21.52%	0	0	ERR	1,714,559	1,929,854	12.56%
Chouteau	68,315	35,903	-47.44%	11,594,267	10,654,763	-8.10%	1,000,531	1,018,732	1.82%	122,652	143,199	16.56%	0	0	ERR	12,765,964	11,852,600	-7.30%
Daniels	3,864	3,769	-2.94%	2,133,998	2,132,844	-0.04%	214,808	222,345	3.51%	21,466	25,033	16.62%	0	0	ERR	2,373,753	2,363,990	0.43%
Dawson	196,734	235,918	19.91%	1,973,579	2,003,235	1.50%	849,475	868,185	2.20%	19,428	27,182	39.91%	979	4,975	408.34%	3,040,216	3,139,495	3.27%
Fallon	0	0	ERR	623,928	639,575	2.31%	586,693	605,906	3.27%	75,367	89,882	19.26%	0	0	ERR	1,285,967	1,335,353	3.84%
Glacier	51,078	57,711	12.99%	2,531,639	2,388,546	-6.39%	614,319	619,729	0.88%	48,085	57,949	20.31%	0	0	ERR	3,265,121	3,123,935	-4.32%
Hill	18,805	8,711	-53.68%	6,328,522	6,391,074	0.99%	468,467	449,132	-4.13%	13,535	20,049	48.13%	896	0	-100.00%	6,830,224	6,868,967	0.57%
Liberty	4,727	28,127	495.03%	3,354,420	3,250,418	-2.80%	288,459	293,742	1.83%	15,017	16,979	13.07%	0	0	ERR	3,662,623	3,599,267	-1.73%
McCone	23,674	37,153	56.94%	2,732,324	2,694,959	-1.37%	670,628	696,792	3.90%	25,975	30,379	16.96%	243	277	14.15%	3,452,843	3,459,359	0.19%
Phillips	148,501	216,579	45.84%	2,098,117	2,194,714	4.60%	1,089,440	1,148,285	5.40%	109,401	129,304	18.19%	0	0	ERR	3,445,459	3,688,881	7.07%
Prairie	187,419	196,017	4.59%	548,567	553,410	0.88%	356,319	369,279	3.64%	27,647	32,431	17.31%	0	0	ERR	1,119,952	1,151,137	2.78%
Richland	535,917	653,640	21.97%	2,004,682	1,976,888	-1.29%	836,415	854,903	2.21%	88,205	104,713	18.71%	0	0	ERR	3,465,220	3,592,144	3.66%
Roosevelt	38,294	55,414	44.71%	3,200,657	3,153,129	-1.42%	465,527	481,105	3.35%	85,501	96,039	12.33%	0	0	ERR	3,789,978	3,787,687	-0.06%
Sheridan	0	28,993	ERR	3,114,964	3,096,549	-0.75%	385,743	400,356	3.79%	34,103	37,755	10.71%	0	0	ERR	$3,539,810	3,563,653	0.67%
Toole	9,971	3,878	-41.05%	4,560,853	4,400,704	-3.51%	502,348	511,625	1.89%	34,589	40,286	16.47%	0	0	ERR	3,107,760	4,956,692	-2.92%
Valley	426,191	349,368	-18.03%	3,492,817	3,442,903	-1.43%	844,829	863,250	2.18%	32,474	39,161	20.59%	726	762	5.00%	4,797,036	4,695,443	-2.12%
Wibaux	0	0	ERR	719,390	709,657	-1.35%	369,853	362,354	3.38%	43,007	50,177	16.67%	0	0	ERR	1,132,251	1,142,167	0.88%

D-2 1993 AGRICULTURAL ACREAGE AND ASSESSED VALUE BY COUNTY

COUNTY	Irrigated Acres	Irrigated	S F Acres	Summer Fallow	Grazing Acres	Grazing	Wildhay Acres	Wildhay	C>C Acres	Cont Crop
Blaine	44,885	$1,114,256	356,439	$6,646,965	1,120,877	$4,619,765	24,746	$583,222	0	$0
Carter	0	0	80,226	929,316	1,260,852	4,312,352	42,566	473,527	0	0
Chouteau	8,136	227,715	1,105,385	38,647,557	917,645	3,335,104	21,924	409,505	0	0
Daniels	640	12,946	445,306	7,111,993	199,261	716,026	5,598	71,552	0	0
Dawson	18,039	655,848	421,513	6,578,597	883,468	2,831,584	5,908	64,761	93	3,262
Fallon	0	0	158,662	2,079,759	654,024	1,955,642	25,256	251,223	0	0
Glacier	4,645	170,259	281,395	8,505,463	421,211	2,047,731	12,795	160,282	0	0
Hill	2,748	62,683	1,111,650	21,095,074	458,999	1,561,556	3,092	45,115	60	2,985
Liberty	699	15,757	554,713	11,181,401	234,378	961,530	4,500	50,056	0	0
McCone	4,356	78,913	526,710	9,107,747	801,490	2,235,425	5,420	86,582	39	809
Phillips	40,280	495,002	358,780	6,993,723	1,114,148	3,631,468	21,961	364,671	0	0
Prairie	12,281	624,731	114,778	1,828,557	440,619	1,187,730	7,896	92,156	0	0
Richland	39,039	1,786,391	368,381	6,682,274	747,827	2,788,050	19,894	294,018	0	0
Roosevelt	4,907	127,647	555,642	10,668,856	413,228	1,551,755	17,475	285,003	0	0
Sheridan	0	0	584,601	10,399,881	351,579	1,285,809	8,585	113,678	0	0
Toole	1,412	33,235	670,881	15,202,843	397,331	1,674,493	5,735	115,295	0	0
Valley	41,744	1,420,635	647,327	11,642,723	729,864	2,816,096	8,702	108,245	66	2,420
Wibaux	0	0	124,029	2,397,968	364,141	1,232,844	11,863	143,357	0	0

D-3 1994 AGRICULTURAL ACREAGE AND ASSESSED VALUE BY COUNTY

COUNTY	Irrigated Acres	Irrigated	S F Acres	Summer Fallow	Grazing Acres	Grazing	Wildhay Acres	Wildhay	C>C Acres	Cont Crop
Blaine	45,675	$7,988,715	355,278	$50,840,386	1,122,270	$36,726,145	24,279	$5,188,438	0	$
Carter	0	0	92,531	10,127,464	1,291,274	35,396,419	42,778	4,472,323	0	0
Chouteau	6,591	930,127	1,092,764	276,030,190	906,725	26,392,028	21,597	3,709,831	0	0
Daniels	611	97,655	443,867	55,255,016	199,238	5,760,222	5,909	648,514	0	0
Dawson	18,398	6,111,877	418,872	51,897,276	882,631	22,491,842	6,664	704,185	482	128,876
Fallon	0	0	158,668	16,569,305	651,212	15,697,044	25,450	2,328,560	0	0
Glacier	6,916	1,495,114	280,065	61,879,426	421,376	16,055,152	12,728	1,501,258	0	0
Hill	1,865	225,676	1,142,752	165,571,877	425,569	11,635,552	4,067	519,395	0	0
Liberty	5,525	728,690	551,465	84,466,792	233,444	7,609,901	4,316	439,876	0	0
McCone	5,789	962,518	521,803	69,817,587	800,654	18,051,596	5,391	787,011	39	7,177
Phillips	41,669	5,610,847	376,907	56,857,870	1,133,922	29,748,311	22,158	3,349,839	0	0
Prairie	12,226	5,078,163	115,948	14,337,050	439,650	9,566,811	7,637	840,189	0	0
Richland	38,273	16,933,690	367,471	51,266,529	743,999	22,147,744	19,828	2,712,766	0	0
Roosevelt	7,267	1,435,595	557,443	81,739,087	414,154	12,463,851	17,180	2,488,067	0	0
Sheridan	3,132	751,117	585,156	80,221,483	352,635	10,371,925	8,193	978,102	0	0
Toole	1,286	152,277	672,338	114,007,865	397,704	13,259,707	5,682	1,043,668	0	0
Valley	43,858	9,050,981	643,750	89,194,384	726,791	22,364,001	8,775	1,014,541	66	19,749
Wibaux	0	0	124,720	18,384,888	364,052	9,905,545	11,629	1,299,913	0	0

APPENDIX E

SPILL DATA FOR FIVE DOWNSTREAM HYDROPOWER FACILITIES

RECEIVED
MAY 26 1995
DNRC

John Goroski
Energy Division, DNRC
1520 East 6th St.
Helena, MT 59620-2301

Dear Mr. Goroski,

Enclosed is the data that you requested. I pulled the data from our database in the form of daily values. I figured up the monthly values for you since the daily listing turned out to be fairly long. In addition, I tried to edit out as much extraneous data as possible. There were times when water was spilled that was not in excess of power plant capacity. An example would be if a few thousand cfs was used to flush debris from the spillway gates for a few hours. Big Bend has never had a spillway release. Also note that the only time water was spilled from Oahe was during the tailrace repair in 1991. All units were unavailable during that time, and the water was released through the outlet tunnels. Some of the other data listed could also have been released through the outlet tunnels and not the spillway. The values are not differentiated in our database. I assume this will not matter for what you need the figures for.

I can send you the daily listing if you find that you need the data. If you have any questions please feel free to contact me at (402) 221-7351.

Mike Swenson
Power Production Section
Reservoir Control Center

SPILL DATA SINCE 1967

GARRISON	1000 CFS	1000 AF
Jun-75	74.1	147.0
Jul 75	854.1	1694.1
Aug 75	545.4	1081.8

OAHE	1000 CFS	1000 AF
Oct 91	102.9	204.1

FORT RANDALL	1000 CFS	1000 AF
Jul-69	5.0	9.9
Aug-69	265.5	526.6
Sep-69	247.7	491.3
Oct-69	81.4	161.5
Nov-69	16.6	32.9
Sep-71	6.5	12.9
Oct-71	60.1	119.2
Nov-71	44.4	88.1
Sep-72	22.2	44.0
Oct-72	53.4	105.9
Nov-72	38.2	75.8
Jul-75	189.3	375.5
Aug-75	443.2	879.1
Sep-75	478.6	949.3
Oct-75	525.2	1041.7
Nov-75	517.2	1025.9
Dec-75	12.1	24.0
Aug-78	136.7	271.1
Sep-78	149.3	296.1
Oct-78	222.9	442.1
Nov-78	237.4	470.9
Dec-78	1.4	2.8
Oct-86	36.2	71.8
Dec-86	49.5	98.2

GAVINS POINT	1000 CFS	1000 AF
Jun-69	12.7	25.2
Jul-69	69.8	138.4
Aug-69	565.9	1122.5
Sep-69	535.4	1062.0
Oct-69	342.6	679.5
Nov-69	117.6	233.3
Jun-70	10.6	21.0
Jul-70	160.2	317.8
Aug-70	279.4	554.2
Sep-70	185.9	368.7
Oct-70	206.1	408.8
Nov-70	151.6	300.7
Apr-71	9.1	18.0
May-71	277.4	550.2
Jun-71	376.8	747.4
Jul-71	363.5	721.0
Aug-71	355.4	704.9
Sep-71	365.5	725.0
Oct-71	423.1	839.2
Nov-71	467.8	927.9
Dec-71	38.1	75.6
Apr-72	176.6	350.3
May-72	78.1	154.9
Jun-72	151.7	300.9
Jul-72	267.3	530.2
Aug-72	368.2	730.3
Sep-72	369.8	733.5
Oct-72	425.7	844.4
Jun-75	322.7	640.1
Jul-75	552.0	1094.9
Aug-75	774.1	1535.4
Sep-75	764.0	1515.4
Oct-75	800.5	1587.8
Nov-75	800.9	1588.6
Dec-75	58.8	116.6
Jun-76	68.6	136.1
Jul-76	81.5	161.7
Aug-76	69.2	137.3
Sep-76	56.4	111.9
Oct-76	4.5	8.9
Dec-76	12.9	25.6
Jun-78	101.4	201.1
Jul-78	301.5	598.0
Aug-78	462.5	917.4
Sep-78	462.5	917.4
Oct-78	527.5	1046.3
Nov-78	525	1041.3
Dec-78	30.1	59.7
May-79	61.7	122.4
Jun-79	106.9	212.0
Jul-79	18.9	37.5
Sep-79	18.7	37.1
Oct-79	26.3	52.2
Nov-79	2.7	5.4
Dec-79	5.7	11.3
Jul-80	5.3	10.5
May-81	33.0	65.5
Nov-82	116.2	230.5
Dec-82	17.4	34.5
Jul-84	139.6	276.9
Aug-84	260.1	515.9
Sep-84	243.8	483.6
Oct-84	226.3	448.9
Nov-84	259.3	514.3
Dec-84	10.5	20.8
Mar-85	10.8	21.4
Aug-86	50.3	99.8
Sep-86	61.1	121.2
Oct-86	125.2	248.3
Nov-86	191.2	379.2
Dec-86	156.0	309.4
Jan-87	17.1	33.9
Apr-87	4.7	9.3
Mar-88	3.5	6.9
May-88	10.5	20.8
Sep-88	19.9	39.5
Nov-88	197.3	391.3
Jan-89	11.9	23.6
Apr-89	5.4	10.7

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APPROXIMATE WATER EQUIVALENTS

1 cubic foot = 7.48 gallons

1 acre-foot (af) = 43,560 cubic feet, or 325,851 gallons
An acre-foot covers one acre of land one foot deep

1 cubic foot per second (cfs) = 448.8 gallons per minute

1 cfs = 40 Montana statutory miner's inches

1 cfs = 646,316 gallons per day
for 24 hours = 1.98 acre-feet
for 30 days = 59.5 acre-feet
for 1 year = 725 acre-feet

1 million gallons = 3.07 acre-feet

1 million gallons per day (mgd) = 1,122 acre-feet per year

1,000 gallons per minute (gpm) = 2.23 cfs

1,000 gpm = 4.42 acre-feet per day

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